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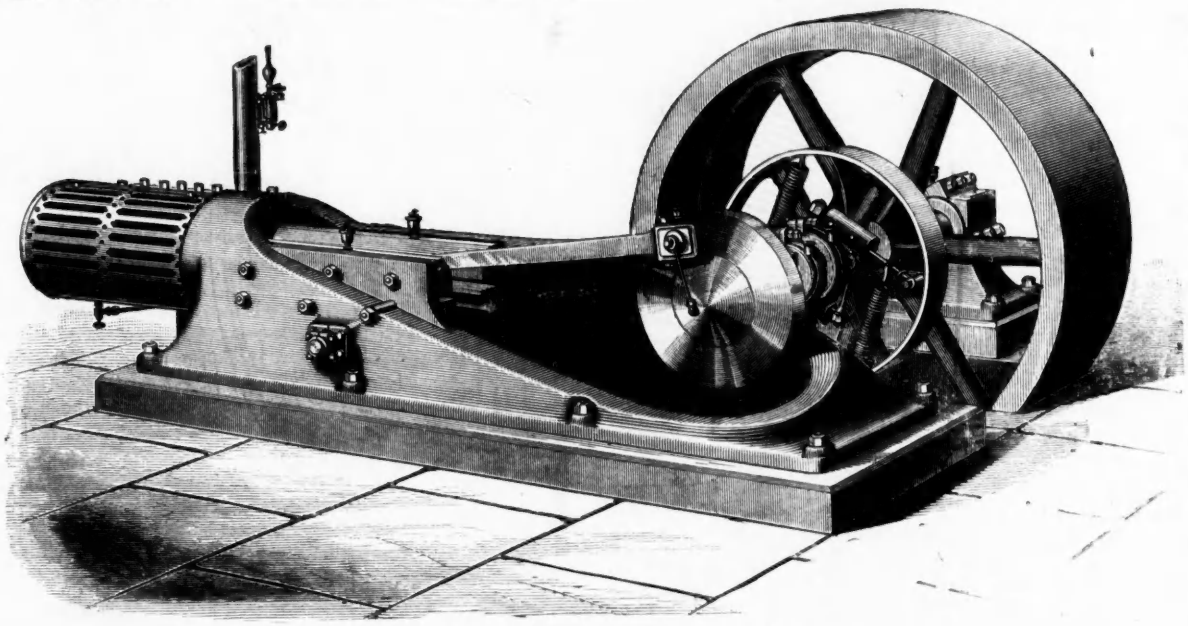
The New Hartford Automatic Engine.

We illustrate this week the new engine of the Hartford Engineering Company, built at their works at Hartford, Conn., and known as the Hartford Automatic Engine. This engine is in reality a redesign, involving radical improvements, based on the Buckeye or Thompson system of valve gear.

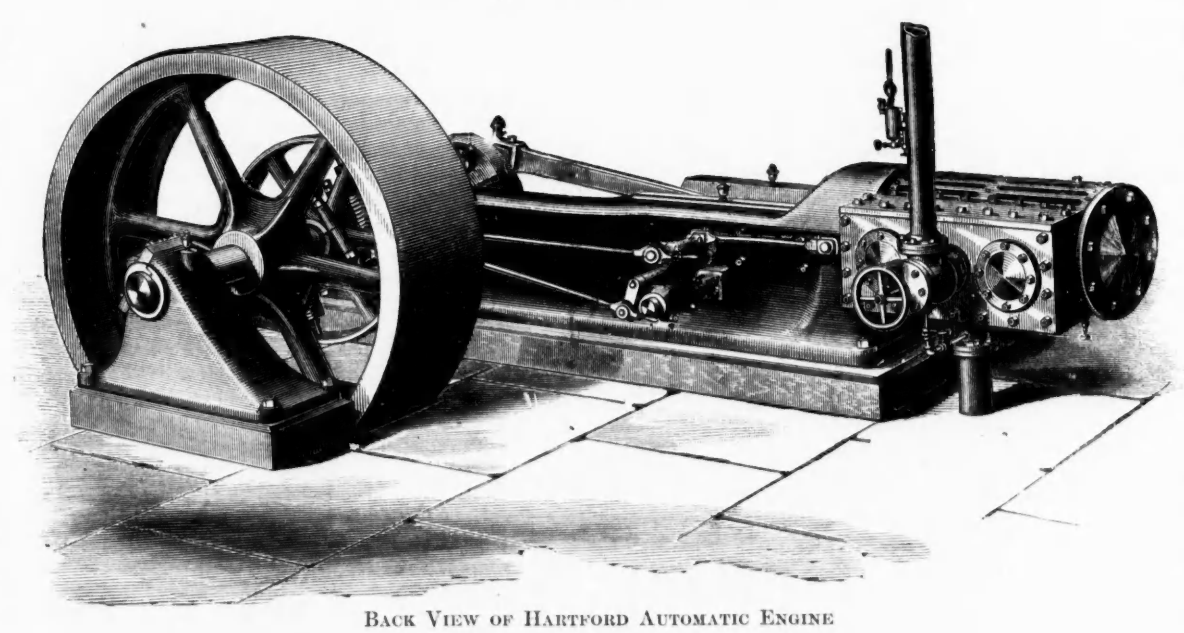
As is well known, the Buckeye engine has had a somewhat phenomenal sale in the Eastern market, until at the present time the demand has entirely outgrown the capacity of that company's shops. As might be expected, experience gained in the practical operation of a large number of these engines has developed points for improvement; and advantage has been taken of the organization of the new company to entirely re-design this engine on the basis of the knowledge thus gained, it being the intention that it should represent in all its detail the latest and best engineering skill and practice.

Our engravings represent a front and back view of the engine, together with a horizontal section through the cylinder, valves, etc., a cross section through the slides, and a detached view of the governor.

It will be seen that the bed is of the Tangye type, and has in its design received the particular attention so necessary in high-speed practice. It is very heavy, and has a notably broad bearing surface on the foundation, and, unlike most other beds of this class, has a large amount of metal judiciously distributed above the center line, so as to transmit the strains in a direct line from the cylinder to the bearing of the main pillow block. The end of the bed to which the cylinder is attached is strengthened by a massive hood, and further rigidity is obtained by a diagonal rib down the front. Particular attention seems to have been paid to the concentration and distribution of metal at the main bearing, and the bed is hollowed out in such a way as to catch and retain the drip. On the whole, it presents a harmonious distribution of metal representing strength and good taste.



FRONT VIEW OF HARTFORD AUTOMATIC ENGINE



BACK VIEW OF HARTFORD AUTOMATIC ENGINE

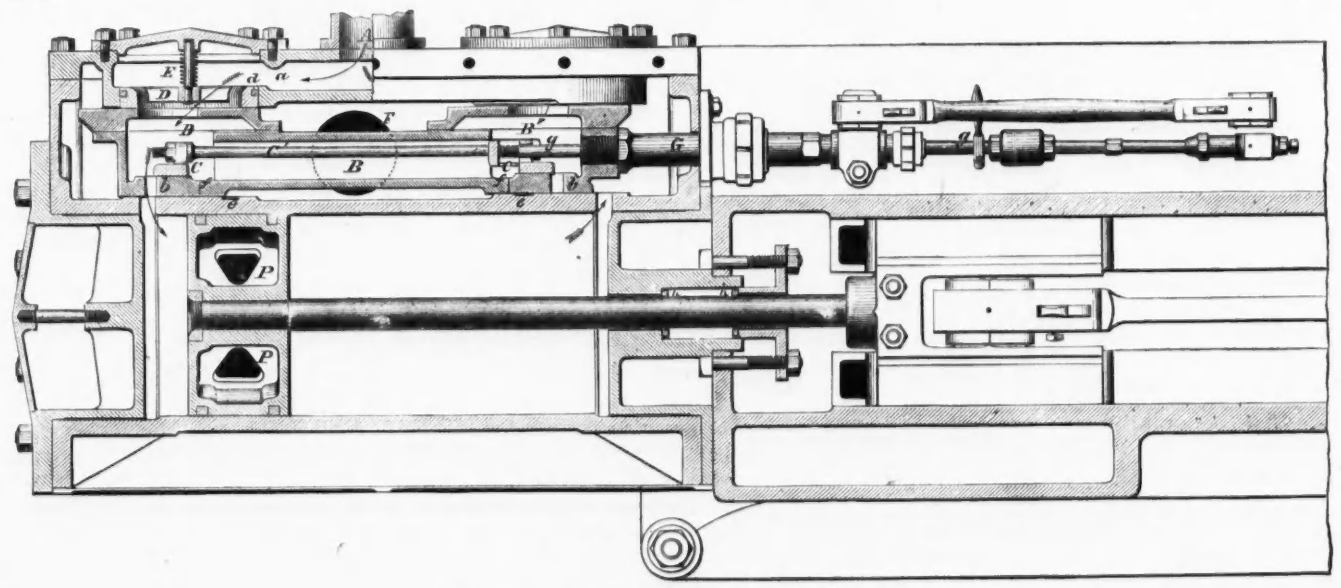


FIG. 1.—SECTION OF CYLINDER AND VALVES.

Referring to the valve motion: The main valve *B B*, Fig. 1, is hollow, and is actuated by the motion of a plain eccentric. This valve is balanced by equilibrium rings *D* on its back to about 85 per cent. of the total pressure, and is scraped and fitted to its seat in the most careful manner, *and under full steam pressure.* By this means it will be seen that the valve and seat are brought into the necessary intimate contact, while under the exact conditions which obtain when in actual use, whereby all distortion from pressure and expansion are eliminated during the operation of fitting; while the peculiar construction of the valve is such that the engine may at any time be run with the steam chest bonnet removed, when any leakage will at once be detected.

The cut-off valve consists of two light plates *C C*, working on a seat inside the main valve, and operated through the compound rock shaft *A B*, Fig. 2, from a loose eccentric, which is under the control of the governor, as shown in Fig. 3.

The office of the governor is simply to advance the position of the eccentric *C*, Fig. 3, in relation to the revolution of the shaft, thereby determining the point in the piston travel at which the steam shall be cut off to maintain the determined speed; and being connected directly to the eccentric, the use of belt or gears is avoided.

The valves being balanced, having flat wearing surfaces, and having a constant travel in reference to the cylinder and to each other—a result brought about by means of the compound rock shaft—the tendency is to increasing tightness by continued use.

The valve motion being positive, the speed of the engine is unlimited in this respect, while there being but two ports in the cylinder the chances of loss from leakage are materially diminished, and the clearance reduced to a minimum, it being 2 per cent. of piston displacement and under.

The piston, which is made light, and in one piece, has a depth equal to one-half its diameter, whereby ample wearing surface is obtained, and is packed with two simple spring rings, which require no adjustment. Loose rings *h h* in the stuffing box are ar-

ranged to give the piston rod freedom, thereby preventing cutting.

The cross head is of the locomotive type, fitted with a steel pin and gun metal shoes, and is split and finished in such a way that when bolted together it binds so tightly on the thread of the rod as to require no jam nut, while at the same time it can be readily loosened to admit of adjusting the length. Both guides are adjustable for lining the cross head.

The connecting rod is finished flat, and gradually increases in the area of its cross section from the cross head to the crank pin end, it being intended, in this respect, to proportion it for its entire length with reference to the strains to which it is subjected.

The crank pin is of steel, three-tenths of the diameter of the cylinder both in length and diameter, and is accurately finished by grinding on dead centers. The crank-pin boxes are of hard metal, lined with babbitt, and are fitted to a solid head on the connecting rod, in which they are adjusted by a wedge and screw.

The crank is a counterbalanced disc, and the shaft is of hammered scrap iron, in diameter equal to one-half the bore of the cylinder, and with journals two diameters in length.

The main eccentric is adjustable on the shaft, so that the compression can be controlled to insure smooth running.

All bearings are provided with two means of lubrication; the one automatic, and answering all ordinary purposes, while the other is positive, and is for use in case of the choking or clogging of the automatic devices. Throughout there is ample and simple means of adjustment and compensation for wear.

It is the claim of the company that in design and workmanship this engine is a representative of the best practice of the day, and that no pains looking to the interests of their customers has been or will be spared. Their practice comprehends moderately high speed —from 100 to 200 revolutions, according to size—steam pressure of about 80 lbs. and fairly heavy loads—corresponding to a cut-off at about ¼ stroke.

Next week we shall publish diagrams from one of these engines, illustrating their recommendations, particularly with reference to load.

William Lee Church and George A. Barnard are the engineers of the company, and Harris Tabor is general superintendent. New York Offices, Rooms 72 and 73 Astor House.

A French scientist has made the important discovery that woman is in every way inferior in point of development to man — a conclusion which he claims to have arrived at after much scientific research. More than this, he has published these (as he calls them) facts. We don't envy the learned individual his immediate future happiness. Some discoveries are the better for being kept secret. We wish it distinctly understood that we don't believe a word of it, and only chronicle the item as part of the scientific current literature of the day.

An artillery bomb—the recent invention of a German—has its interior divided into several chambers, each of which contains a substance non-explosive in itself, but of such a nature that, when mixed with the contents of the other chambers, an explosive of remarkable power is formed. The shock of firing breaks the partitions, and allows the contents of the chambers to become mixed.

Some of our large cotton mills are experimenting with cotton duck for roofing purposes. It is said to have been tested for more than a year, with satisfactory results. The general use of this material for the purpose named would have considerable effect in stimulating manufacture, and help in solving the problem of a new market for cotton goods.

An Opportunity for Boys.

Since the hot weather has passed and the evenings are getting longer it is a wise course for the apprentice and young mechanic to lay out his work for the long winter evenings. Our advice to such is, if you have no arithmetic, get one, and study it, also read good books and periodicals. Procure a case of drawing instruments and a treatise on engineering and mechanical drawing. One young man within our acquaintance has been saving up his money during the summer months, for the purpose of buying a large treatise on mechanical drawing. If you are located in a boarding house, make arrangements at once with the landlady to either have fire in your room, or so that you can have the privilege of a portion of a comfortable room for an hour or two each evening during the week. Do not say it is too much trouble and that such efforts on your part will amount to nothing, but take courage, raise your head and push forward, resting assured that your efforts will not be in vain. In conversation with an apprentice the other day he said, "There is no use for me to try to get ahead in the shop where I am at work. The foreman is one of those men who exerts himself only to keep things a-going, and takes no interest in the boys to teach them anything."

It is true such experiences are unpleasant, particularly to the young man who expects the foreman to give him credit when he does a good job. But we wish to persuade the apprentice to forever give up the practice of looking for praise or even credit for good deeds or work in a machine shop. If praise is given it is pleasant, of course, but it should never be looked for.

Many a bright boy has been ruined through making this grievous mistake.

Take the case previously mentioned, where the young man thought he could not advance because the foreman took no interest in the boys, and let us inquire if his situation was as bad as he represented. We quietly heard all his complaints, then asked him what course he intended to pursue in order to better his condition. The answer was that he could see none. We then proceeded to give him a brief lecture, advising him to procure a note-book for ten cents, and proceed to copy all of the screw-cutting tables attached to the lathes in the shop, carefully noting the number of threads to the inch upon the leading screw, the number marked upon each gear, and other data he might choose to put down, such as the size and swing of the lathe, and manufacturer's name. He must then figure up the single sets of gears for cutting different threads to the inch, without referring to the tables until all the gears have been worked out. The table might then be inspected and the mistakes rectified. After working out single gearing, he should then undertake compound gearing, calculating for each lathe in the shop separately, until they have all been worked out. He should then measure all the pulleys, beginning with the fly wheel of the stationary engine, and from it work out the speed of each shaft. If in a railroad shop, careful dimensions of each part of the locomotives should be taken and sketched out, which should be looked over; then in the evening at home a drawing of a pump, cylinder, or any other part, should be made from memory. Each dimension should be carefully marked, and when complete, the original sketch should be produced and the dimensions compared.

Again, sketches should be made of all the peculiar devices in the shop and tool room, together with their dimensions. All this and a great deal more the young man referred to was told he might do without any assistance from the foreman, and when that individual saw the interest taken by the young man in machinery generally, he would have confidence in such a person, and before he thought of it he would begin to ask for information himself. Such has been our experience.

The boy who *comes* to school learns rapidly, but the boy who is *sent* seldom learns much until in after years he sees the advantages of knowledge. The time taken to do all the things suggested above must necessarily be taken in the morning or at night, and it is time well spent. Many a time have we gone out on a locomotive and returned about midnight; or climbed about the dusty timbers of a machine shop or blacksmith's shop on a hot summer's night to find out some practical problem connected with shafting and gearing.

We do not find ourselves any the worse for wear; on the contrary, the rough exercise hardened our muscles and gave us a rugged constitution. Our young friend to whom we have alluded left us much wiser, and with a promise to do as we had suggested. And now we commend the same course to our young readers, well knowing the benefits they will derive from it. The fact is, when a man gets a thorough knowledge of any trade or profession, some one is sure to find it out and will want his services. The old phrase, "It is always darkest before day," has been realized in the history of many a man who has grown by his own exertions to fill a responsible position. Even after he had mastered his business, there may have been a period when it appeared as if his exertions had been in vain. Such instances frequently happen, but people soon find them out, and they are offered positions of honor where they can develop and mature their ideas. The boy that *will* succeed gets along, but the boy who is apprehensive of failure never attains only a partial success.

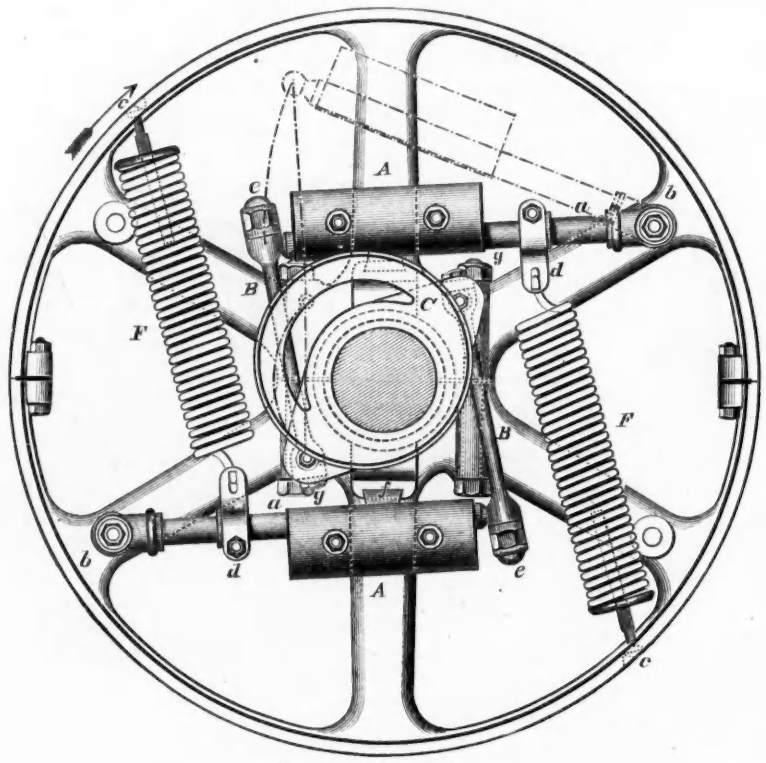


FIG. 3.—GOVERNOR.

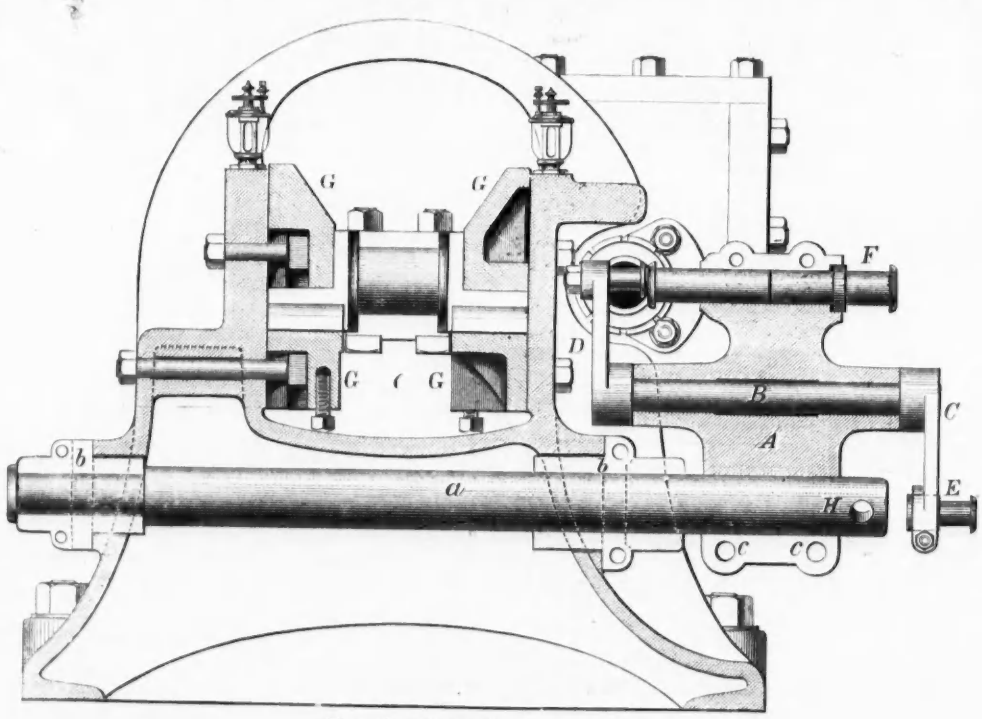


FIG. 2.—CROSS SECTION OF BED.

Counter-Balancing of Engines and other Machinery Having Reciprocating Parts.

BY S. W. ROBINSON.
(Prof. Mechanical Engineering Ohio State University, Columbus.)

FROM A PAPER READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS AT ALTOONA, PA., AUGUST, 1881.

This subject is an important one, and seems to be none too well understood. Some appear to imagine that a reciprocating piece can be perfectly counterbalanced by a revolving piece, provided the relation of the weights is right. In making a practical search for the right weight, by putting on one and then another, they find none to suit exactly, and wonder what is the matter. The short of it is, *it is simply impossible* for a *single* reciprocating piece to be perfectly counter-balanced by a single rotating piece. It is possible, however, to perfectly counterbalance two reciprocating pieces, like two pistons of equal weight, actuated from one crank pin, and sliding in straight lines at right angles to each other, the lines intersecting at the crank shaft, and this by one coun-

ter-weight. The connecting rods in this case are supposed without weight, and not to have sensible obliquity at mid-stroke. When the connecting rod is 5 or 8 times the length of crank, the counter-balancing can be made nearly perfect, but not quite. In this case of two pistons, if the counter-weight can have its center of gravity at the same distance from the shaft as the crank pin is, its weight should be equal to that of one piston, piston rod and crosshead, the connecting rod being supposed without weight.

But let us take some of the simpler problems first.

The effect of a counter-balance should be considered, with regard to the effect of its centrifugal force. This may be found by the following:

RULES FOR CENTRIFUGAL FORCE.

This force, in lbs., is equal to one thirty-second part, more exactly $1 \div g$, of the weight of the rotating mass in lbs., multiplied by the square of the velocity in feet per second, with which the center of gravity of the weight moves in its path; and divided by the radius, in feet, of the circle of motion of the center of gravity of the weight.

Or again, it is=1.227 times the weight of the revolving mass in lbs., multiplied by the square of the number of revolutions per second, and multiplied by the radius, in feet, of the circle of motion of the center of gravity of the weight.

EXAMPLES.

As an example, suppose a scythe snath weighing 10 pounds be placed inside the rim of a large pulley and tied so as to hold it in position. Suppose the center of gravity of the snath be $\frac{2}{3}$ of its length from the tip end, and 4 inches from the body of the snath. When tied in, suppose this center of gravity be found, by measurement, to be 4 feet from the axis of the pulley. If this distance is 4 feet, it is immaterial what position the snath may have. Then suppose snath and pulley be set to revolving at 100 revolutions per second. The centrifugal force, see 2d rule, will be

F=1.227×10 lbs.+(100 rev.)^2×4 ft. radius
=490.800 lbs.=245 tons.

A very useful fact, in consideration of centrifugal force, is that regarding the center of gravity of the weight to which the centrifugal force is due. It enables us to dispose of all irregular bodies by supposing the whole mass concentrated at the center of gravity, the calculation of the centrifugal force of which is then easily made.

The following examples follow as consequences:

1st. Suppose a balanced pulley A, with three weights riveted upon it as at C, D, and E. The center of gravity of each is shown by a dot in Fig. 1. We usually suppose that if the system is in balance when the axis of the pulley rests on knife edges, that it will run without shake. That is true if the centers of gravity are all in one plane, perpendicular to the axis of pulley. That would do possibly for a proof of the above principle regarding the reduction of mass to its center of gravity. According to that, suppose the angle $A\,E\,D$,=90° and $C\,A\,E$, =$C\,A\,D$,=180°—45°. The center of gravity of the two weights, E and D, is evidently at B, if the weights are equal. Then the added weights of E and D, must be to that of C, as $C\,A$, is to $A\,B$.

By calculation,

$$\frac{A\,B}{A\,C}=0.7071.$$

Hence

$$\frac{\text{weight of } C}{\text{weight of } (E+D)}=0.7071=\frac{A\,B}{A\,C}$$

From the rule it evidently does not matter where the weights E and D are placed along the line $E\,D$ produced, provided they are at equal distances from B.

Again, it is immaterial what position the weight C has, provided its center of gravity remains at C. That is, any position shown by dotted lines in Fig. 2 may be taken. At first this seems untrue, because the ends of the elongated weight C, for one position, are much farther from the axis of revolution than for that position where it is parallel to the axis. But the radius to the center of gravity is constant.

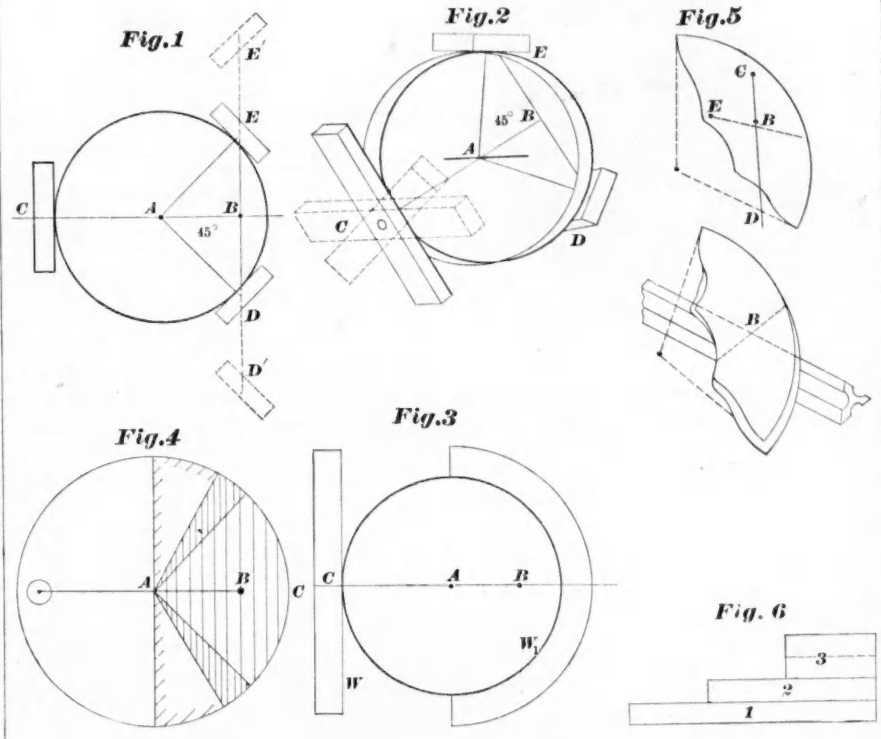
2d. Suppose weights W and W_1 attached to the pulley, as shown in Fig. 3. Let the thickness of the two weights be the same, and attached to the true rim of the pulley by rivets or flush screws so that it will not be necessary to take screw heads into account.

Then, if the thickness of the weights is $\frac{1}{10}$th the radius of the pulley, the distance to the centers of gravity will be, as found by calculation:

$A\,B$=0.669×radius of pulley,
$A\,C$=1.05×radius of pulley,

and hence $\frac{W}{W_1}=.6371=\frac{A\,B}{A\,C}$

Hence, if W_1=100 lbs., W=63.71 lbs.



3d. Suppose three cases of counter-weight of an engine or jig saw in form of a sector of a circle, 1st, of 180°; 2d, of 120°, and 3d, of 90°, and of uniform thickness, all having the same radius as shown in Fig. 4.

Then, by calculation:

$A\,B$=.424—$A\,C$ for sector=180°.
$A\,B$=.734—$A\,C$ for sector=120°.
$A\,B$=.599—$A\,C$ for sector=90°.

and centrifugal force for 120° =.866.
centrifugal force for 180°

centrifugal force for 90° =.707.
centrifugal force for 180°

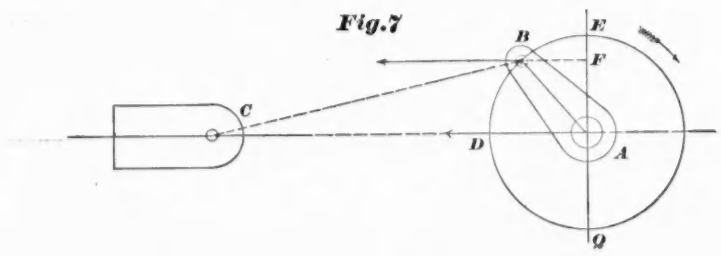
That is, if we add 50 per cent. to the sector of 120° by extending it to 180°, with the same thickness, we increase the centrifugal force only about a seventh. Again, if the sector of 90° be extended similarly to 180°, or the weight doubled, the centrifugal force will be intensified only about a third. These figures show the comparatively small value of parts of a counter-balance which are nearly opposite each other.

PRACTICAL ESTIMATION OF COUNTER-BALANCE WEIGHTS.

In designing counter-balance weights, which are of uniform thickness in the manner of the weights in Fig. 4, a convenient way to proceed is to cut out a piece of card board of the shape of the weight, as shown in Fig. 5, find its center of gravity by hanging it upon a pin C, so that it will swing freely, then note a vertical line through the pin, by means of the plumb line $C\,D$. Then similarly find a second line, $E\,B$, intersecting the first at B. Then B is the center of gravity, and its distance from the axis of rotation is readily found when the weight is mounted in position. If the weight of the piece is known, the centrifugal force can be calculated easily. The center of gravity is, perhaps, most conveniently obtained by balancing the card board weight on a knife-edge, and noting the line for two positions, as shown in the second part of Fig. 5.

The actual weight of the counter balance, Fig. 5, however awkward in outline, may be found by cutting a square from the same piece of cardboard from which the above shape, Fig. 5, was cut, and large enough to represent a square foot on the same scale by which Fig. 5 card was cut. For instance, if Fig. 5 is cut "half size," the square piece would be one-half a foot, or 6 inches square. Now weigh the two pieces of card separately. Then if the Fig. 5 piece weighs $\frac{2}{3}$ as much as the square piece, the actual iron weight, Fig. 5, 1 inch thick, will weigh two-thirds as much as a piece of iron 1 foot square and 1 inch thick.

When the counter weight has several thicknesses, we may proceed similarly. For instance, suppose one part of the weight, Fig. 5, has a certain thickness, another part twice as thick, and a third part four times as thick, as shown in Fig. 6. That is, the slices Nos. 1 and 2 are of equal thickness, while the part No. 3 is twice as thick as 1 or 2, as stated. Then cut one piece of card for No. 1, one piece for No. 2, and two pieces for No. 3. Then pile them, and stick with a little gum, so that we have the counter balance in miniature. Then find the center of gravity, as before. Also weigh it, and weigh a piece of the same card cut to the same scale, and representing one square foot. Then the actual counter-balance weight, Fig. 6, 4 inches thick, will weigh as many times the weight of a piece of iron one foot square and one inch thick, as the card-board weight, Fig. 6, is times heavier than the card representing one square foot. Or, if a planimeter is at hand, the areas of the several pieces may be obtained before piling. Of course the relation of the areas will be the same as that of the weights of card board or of the iron. Knowing the weight of the counter-balance and the position of its center of gravity, not only the amount of its centrifugal force, but also the direction of it will be readily found, the direction being that of a line passing through the axis of rotation and of the center of gravity.



ACTION OF RECIPROCATING PARTS UPON A CRANK PIN.

Let us next inquire into the action of a reciprocating piece, like a piston, upon the crank pin by which it is actuated. First, consider the connecting rod as without weight, and as causing no sensible modifying action, on account of its obliquity at mid-stroke. Also suppose the crank pin to move with uniform velocity in its orbit, as when a fly wheel is mounted on its crank shaft.

Then for the position shown in Fig. 7, the piston is being dragged toward A, and the force exerted against the crank pin will be nearly parallel to the line $A\,C$, this force being caused by the acceleration the piston is undergoing. For the crank pin at E, the piston will have attained the speed of the crank pin in its path, and the acceleration will be zero. At D, the acceleration, or rate of increase of speed of piston, will be the greatest; and hence at this point the pressure against the crank pin is at its maximum. The pressure of steam on the piston in expansion, cushion, &c., is without account in causing shake, because the same pressure which is being exerted on the piston has an equal reaction upon the cylinder heads. The shake of the engine, jig saw, etc., is a vibratory motion of the frame of the machine, and is due to forces acting upon the frame. As regards a line through the shaft and cylinder, it matters not whether the whole force acts upon the pillow block, as in absence of steam, or partly there and partly on cylinder head, in presence of steam.

A rule determined by aid of the higher mathematics, for the pressure upon the crank pin, due to the acceleration of the piston, is to the effect that at D, the pressure is the same as would be the centrifugal force of the reciprocating parts C, were they hung upon the crank pin and revolving with it, the center of gravity of C being placed at the crank pin center. Also at other points B, this pressure diminishes in proportion to the cosine of the angle $B\,A\,D$. A simple diagram represents this pressure for any point in the revolution. For instance, let $A\,D$ represent it for the pin at D. Then $B\,F$ being the cosine of $B\,A\,D$, will represent it for the pin at B, both in magnitude and direction.

As regards shake, the point of application of this force is at A, it being transmitted from B to A, along the crank. It tends to pull the engine in the direction A toward D, while the crank pin is in the half circle $Q\,D\,E$. But it is opposite for the next half circle, etc. Therefore, though a horizontal line from any points B to F, represents the direction and magnitude of the pressure tending to cause shake, its point of application is always at A, and hence the shaking force is completely determined.

(Concluded next week.)

A Cohoes, N. Y., man writes us that he has a block of cast iron four feet square and four feet high that he wants to break up for the foundry, and wants to know how he can do it. "It stands in a lot away from any house," says the writer, who asks for our opinion in the matter. We cheerfully give our advice: Invite those scientific gentlemen who are inventing and manufacturing explosive machines and compounds for blowing up ocean steamships to a free test of the efficiency of their most powerful agents upon this fourteen and a half-ton block of iron. Any compound or device that will effectually shiver it into pieces small enough for the foundry can be trusted to blow the strongest steamship to smithereens. This course will save money. Drilling and blasting upon the old plan might cost as much as the iron is worth.

The Atlanta *Constitution* says one of the signs of the times is eight Southern boys—college graduates with diplomas in their pockets, working with a surveying party at about one dollar per day and doing the hardest kind of work at that. If that sign is common we agree with the *Constitution* that it is a sign which means prosperity anywhere.

Manufacturer's Bench Drill.

Last week we illustrated several new machine tools, built by the Pratt & Whitney Co., Hartford, Conn. In continuation, we this week illustrate a new drilling machine made by the same Company, and which is known as the Manufacturer's Bench Drill, No. 3.

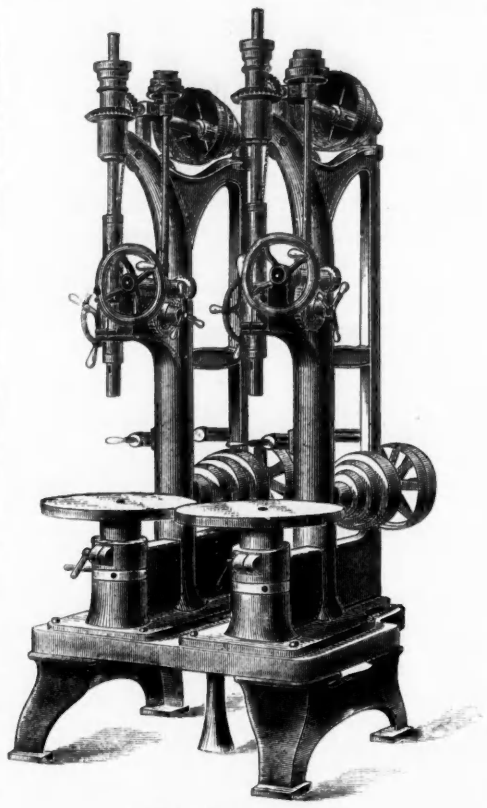
Our engraving represents this machine as constructed with two drills on one table, but they are furnished with three when wanted, and are made with or without back gears.

The spindles are of steel, accurately conterbalanced, have quick-return movement, automatic feed, and by means of approved attachments are instantaneously adjustable to any point within their range of movement. The drilling table is also adjustable.

The countershaft is permanently attached to the frame, which being constructed with the rear vertical brace, as shown, makes the machine self-contained and extremely rigid.

The four change cone pulleys for wide belt give a good range of speed and strong motion without back gears, and when fitted with back gears a great variety of work may be done with one of these drills.

Altogether this machine is expressly designed for rapid work, as in large manufacturing establishments, where, as may be readily seen, two or three times the amount of work may be done with one of them that can be done with a single spindle drill.



NEW BENCH DRILL.

Some time since we illustrated and described a wire belt, the invention of Col. Gear, which is made by winding the wire around a mandrel of suitable size, thereby forming a spiral, which is fastened together by a proper device, and is run in grooved pulleys adapted to its use. We learn from *Der Techniker* that our German friends are busy at the present time inventing that same belt, and, from the description given, we feel inclined to congratulate Herr J. Jarolinex, the inventor (?) upon following so closely the specifications of the Colonel in this matter. The only suggestion pertinent is that it seems some unnecessary delay has been made. With Col. Gear's specifications at hand, it ought to have been invented in Germany some months since.

Locomotive Boiler Cleaner.

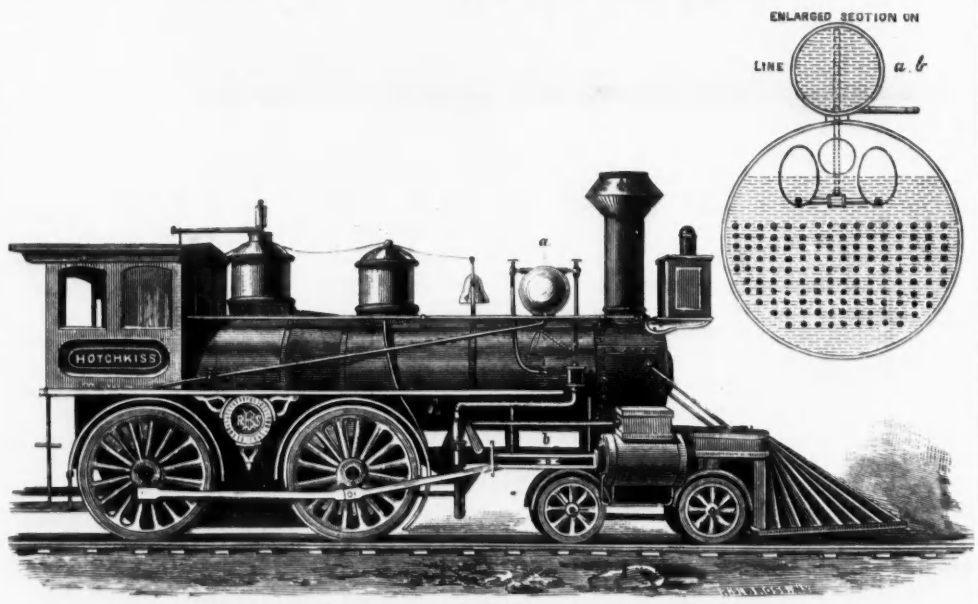
The illustration presented herewith represents the Hotchkiss mechanical boiler cleaner, as applied to a locomotive. It is not absolutely necessary to make the pipe connections arbitrarily as here represented, but any necessary arrangement of pipes can be made without extra trouble to suit the different locomotive boilers now in use. When desirable the *upflow* pipe can enter the smoke arch, making connection with one or both funnels through the front head of boiler. The return pipe may enter the boiler on the side, near the check valve, as shown, or may pass through the top of shell into the boiler, as in ordinary cases. In the illustration the cleaner is represented as having two funnels, one on each of the dry pipe, and connected to one upflow pipe. This arrangement is preferable and necessary where the dry pipe divides the water longitudinally, otherwise a single funnel is sufficient. The blow-off pipe may be led in any direction desirable, but the best way is to have the valve within reach of the engineer, as shown. This cleaner, it will be understood, works upon the principle of collecting the scum, and scale-producing substances at the surface of the water, or, in other words, is a perpetual skimmer of the surface. The dirt and matter thus collected is deposited in a reservoir upon the top or side of boiler, from which it is removed by opening a blow-off cock attached to the bottom of reservoir.

This style of cleaner is claimed to be of special value upon locomotive boilers, for the reason that, owing to the peculiar construction of the boiler, cleaning by hand is extremely difficult. It is also said to be a remedy for foaming, which saves time and expense lost through the renewing of burnt tubes. Keeping a boiler clean, and preventing it from foaming, effects a great saving of fuel, besides rendering the boiler much safer in constant use. The boiler cleaner here shown is made and applied by James F. Hotchkiss, 84 John Street, New York.

The Hotchkiss boiler cleaner, as applied to stationary boilers, was described in the AMERICAN MACHINIST of November 8, 1879.

In France a decree, which has lately gone into effect, provides that all cans for fruit, meats, vegetables, etc., shall be soldered outside instead of inside, and that the plate of which they are made shall be covered with pure tin instead of the alloys frequently used for that purpose. In this country, instances of poisoning from eating of the contents of so-called tin cans are becoming common—so common that the matter should receive immediate attention. In the instance of fruit, there is present an acid that rapidly takes up the poison of the lead; and even where no prominent symptoms of poisoning appear, it is probable that much damage to the general health results. This is a matter that can and should be remedied at once.

HEAVY KEY SEAT CUTTING MACHINE.



MECHANICAL BOILER CLEANER ATTACHED TO A LOCOMOTIVE.

Heavy Key Seat Cutting Machine.

The cutting of key seats in a large number of pieces, as gear wheels, pulleys, &c., is always somewhat of a tedious job, and in large manufacturing establishments where much such work must be done, any means for facilitating the operation is of undoubted economy; while, in smaller establishments, an effective and cheap machine for this purpose is equally a necessity.

The accompanying engraving represents a Heavy Key Seat Cutting Machine, built by W. P. Davis, North Broomfield, Ontario Co., N. Y., and which is said to be both effective and cheap.

It will be noticed that the cutter, which is strongly supported above and below, and arranged to be adjusted to give any desired draft to the key seat, is moved to give feed, instead of the piece being operated upon, which is claimed to be an advantage.

Wheels of any diameter may be key seated with this machine, and the cutters can be almost instantaneously changed.

This machine is made entirely of iron; is compact, self-contained, and not liable to derangement.

It will cut key seats from ¼″ to 1″ in width.

Moulding Gear Wheels in Dry Sand or with Cores.

BY THOMAS D. WEST.

To have smooth even teeth is a very important feature in the manufacture of gear wheels, and the only reliable way to make good teeth on large wheels is to have them moulded in dry sand, or with cores. In almost any wheel made in green sand the teeth will be larger than the pattern, as the sand will yield more or less, depending on the way it is rammed. Although there can be nice looking gear castings made in green sand, the same pattern moulded in dry sand will make a casting that will run easier and quieter, and wear longer. A variety of spur wheels could have the arms and hub moulded in green sand, and the teeth in cores, or dry sand, by having an iron ring or flask to carry them, so that the teeth could be hoisted and placed on the oven carriage to be dried.

The sand will require to be closer and tougher for ramming up a spur wheel than for ramming or bedding in a bevel wheel, and should the same sand be used for the bevel as for the spur wheel, the teeth will be very liable to scab. Dry sand in this respect is the same as green sand, as the sides, or any part of a mould that the iron rises up against, will stand harder ramming, and will require less venting than the bottom, or any part that the iron lays over, or on the top of. It is a good thing that this law or principle is as it is, for if the sides had to be rammed as soft, and the sand left as open, as is required to keep the bottom or flat surfaces from scabbing, the side of some moulds would fall down, or cause a deal of extra rod-staying and other precautions to make them stand.

A very essential point in making gears in dry sand is to black the teeth, so that they will be smooth, and not show streaks, or lumps of blacking on them. In blacking teeth the blacking should not be thick, and, if a swab is used in order to quicken the operation, it should only be used for the first coat, and a camel hair brush substituted for the seeond and third coats. To make a good job of blacking requires neatness and care, and a moulder that takes a swab and pastes on the blacking; washes or knocks off the edges of the teeth by rubbing the swab against the mould when there is hardly any blacking on it, and then attempts to finish or patch the teeth by the use of tools, will make a very poor job. Teeth should be blacked with much care, and so smoothly that it is not necessary to touch a tool on them; for if a good job cannot be done with a brush, it cannot be remedied with tools.

There are very few shops that mix their dry sand or loam alike, for the reason that they have different grades of sand to deal with. A suitable mixture of open and close sand to form a loam, or dry sand, that will stand the fall and wash of the iron without scabbing, is generally arrived at by experience, although there are ways of telling whether new mixtures will work right, which I will discuss at some future time. Take any dry sand-facing mixture that works all right on ordinary castings; mix it a little closer; put in one part of sea coal, coke or blacking to from twelve to twenty parts of sand, and it will help to make the sand peel, assist in making smooth teeth, and give them a good color.

The cuts show a good plan for making gear wheels without a pattern, the teeth being formed from cores made in the core box, as shown. In the box is seen the cast iron core frame, rods, lifting hooks and spike nails for holding the teeth. The face of the box *X* is made to be taken off, to allow of drawing the remainder of the box without breaking the core. There is a shrouding on

the top and bottom of the teeth, which is formed in the same box.

There is a tooth sometimes used in gearing that is the largest at the pitch line, so that it cannot be drawn out of the sand flatways like the one shown. For such teeth the core box has to be arranged so that the teeth can be drawn out endways before the core box is drawn off; and to form the top shrouding there will have to be separate flat cores made.

The arms of the wheel shown in cut were made or formed of cores dried in the oven. They could have been made in green sand, but it was safer to make them of dry sand, as there was a deep strengthening rib all around the center of the arms. In moulding or forming this wheel, strike off a green sand level bed, and if the cope is a wooden one that needs gagering, make the level bed hard, ram the cope up on it, soften it up again and finish it ready for setting on the cores. Then, with the sweeping. board attached to an upright spindle, strike a mark around on the bed the diameter of the inside of the teeth; raise up the sweep so as to clear the top of the cores, after which set around the teeth cores, using the sand mark for a guide. When these are all set in their places, screw a strip of wood on the sweep that will come down and clear the inside of the teeth. In sweeping around with this you can see whether the cores are exactly true or not. There are two things that will have to be watched closely in setting the teeth cores. The first is to have the cores set in a true circle, and the second is to have the teeth where the cores join together the same size as otherwheres, in doing which a pair of calipers are useful. It takes time and patience to get the cores to come exactly right, and they may require to be moved several times to get them so. The circle may be right and one of the joints wrong, to remedy which the circle must be made smaller or larger.

In making the core box there are two ways of splitting the tooth, as shown at *D* and *H*. *D* is the best way to make the cores, and *H* the easiest to get at the joints of the cores when set in the mould for the purpose of blacking and drying; which should be so nicely done as not to show in the casting in the least degree.

After the inside joints are daubed, close or daub up the outside joints with mud; ram up the space between the bank and the outside of the teeth cores with sand, so as to keep the cores from being forced out of their places when the iron is poured into the mould. The level bed for setting the core on should be sunk below the level of the floor to the same depth as the face of the wheel, and after the cores are rammed around, go around with the sweep and see if the cores have been moved. If they are all right, take out the spindle and sweep, and set the center core in the print formed by the sweep. After this is done, set in the arm cores dividing them with thick pieces of wood—two for the arms and two for the rim. When all is right try on the cope and secure the arm core vents.

This is a good, cheap and handy plan for moulding one or two wheels without a pattern, but where any considerable number are required, a complete pattern should be provided, since two wheels can be made from a pattern as easily as one without it.

Brain Power and Machine Work.

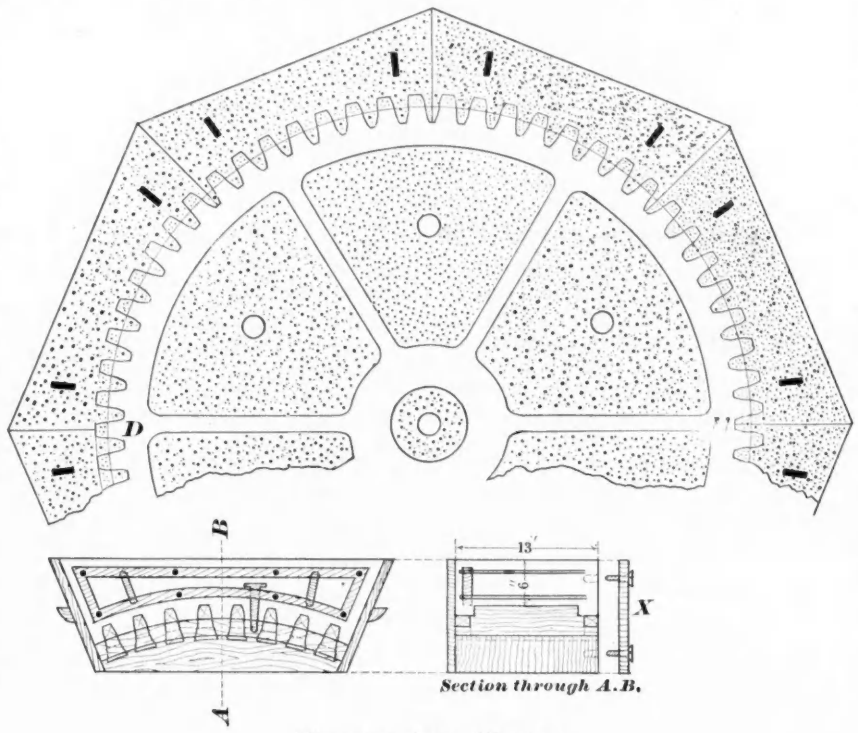
The day of brute force in the machine shop has gone by. The entire operations today are more of the brain than of the muscle, and since some one must furnish the brain work, it is a pertinent question for the individual machinist whether he shall educate himself to supply the larger part of it, *and get paid for it*, or whether on the other hand he shall put himself nearer the level of the machine he operates, and allow some one else to get paid for thinking. This is a matter the mechanic has to settle for himself.

A correspondent writes us that he has found castor oil to be a better lubricant for the crank pin of a steam engine than anything else he has tried.

Improved Horizontal Tubular Steam Boiler.

The engraving presented herewith represents W. A. Hennessey's improved horizontal tubular steam boiler, as built at the R. F. Hawkins Iron Works, Springfield, Mass.

The boiler here shown is built the same as other first-class tubular boilers, with the exception of having at the back end opposite the furnace a cylindrical projection, strongly riveted to the flue sheet. It will be observed from the engraving that this projection is filled with tubes, which extend the entire length of the boiler. By this construction, and the method shown in setting, the products of combustion first come in contact with the bottom of the shell, then pass through the outer tubes at both sides to the front end. They then traverse the length of the central tubes, and escape at the end of the projection alluded to, and enter the flue or chimney.

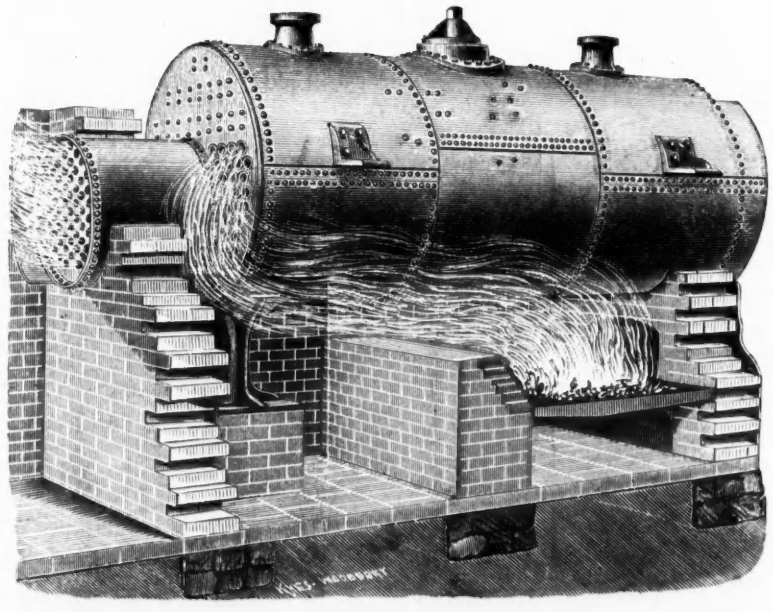


MOULDING GEAR WHEELS.

It is well-known that in most of the tubular boilers as at present constructed, the flame and gases from the furnace pass directly through the tubes located nearest the center of the flue sheet, compelling them to do most of the work, and, in consequence, they wear out much quicker than the other tubes located nearest the shell.

The fact that the greater portion of heat passes through the tubes nearest the center of the boiler, leads us to the reasonable conclusion that if the products of combustion were more equally distributed through all the tubes, the efficiency of the boiler would be greatly increased. The reader will see from the engraving that this object is attained in the practical working of this boiler; also that the flames and gasses pass around the cylindrical projection upon the back end of boiler.

It will be understood from the foregoing description that most of the heat which would, in many instances, be wasted, is hereby utilized. A sheet iron bonnet may be easily attached to the end of the projection if desired. The boiler can be readily cleaned by means of large hand-hole plates in each end of the boiler and projection. The inside of the boiler is accessible by means of a man hole for inspection and repairs. The boiler here shown is made of Benzon steel and is 66 inches in diameter and ten feet long. It has 107 tubes 3 inches in diameter, 52 of which are 10 feet long, and 55 of them 13 feet long. The heating surface is 1140 square feet



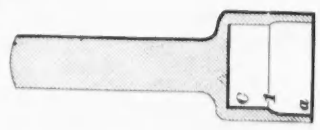
IMPROVED HORIZONTAL TUBULAR STEAM BOILER.

LETTERS FROM PRACTICAL MEN.

Swaging Boiler Flues.

Editor American Machinist:

The little sketch which I send with this represents a tool for reducing the ends of flues, as shown in AMERICAN MACHINIST, issue of August 6, 1881. The reduction is made to admit the copper shim, which must fit nicely.



This tool, which is really a swage, is the invention of Mr. John Miller, foreman of the boiler shop of the Chicago, Milwaukee and St. Louis Railroad Company. It is not patented, nor likely to be, notwithstanding which it is a good tool, and will do first-class work every time. The sketch gives a fair idea of its construction. From *a* to 1 is 1¼", and it must be made to slip easily over a new tube. The distance (*a* to 1) must not be too short. From 1 to *C* represents the size of the flue after swaging. The flue holes are bored the size of flues same as usual.

In using this tool, a few blows with a light sledge is all that is required to bring the end of a flue to an exact size and perfect condition. The ends of the flues should be scraped clean with an old file after annealing.

In my experience, flues set in this way and expanded with a sectional expander are all right for any kind of water.

Minneapolis, Minn. JOHN WALLERS.

To Temper the Ends of Steel Rules.

Editor American Machinist:

Mr. Chordal some time back spoke of throwing away all steel scales with the corners worn off, and another person proposed to save them by planing them down.

I temper the ends of such scales by putting them through a raw potato, letting the end project ¼ inch, or enough to allow heating, the potato keeping the rest cool. When hot I plunge the end in water. The shrinkage is slight, and the ends are left very hard.

Dayton, O. W. J. HALL.

Hardening Steel.

Editor American Machinist:

Mr. J. W. Goodyear, in his article on "Hardening Steel in Liquids or Compounds," takes exception to the term "Flux," when applied to some material used for other purposes than for welding or melting steel. I could find no better word, and shall be much obliged to him if he will kindly propose some more appropriate term. The superintendent of one of the largest steel manufactories in this country, a man of experience and knowledge, suggested the word flux to designate the compound used to toughen steel before hardening. That such compounds exist and are being used every day by men experienced in hardening steel for tools and other purposes, there can be no doubt, unless they are all mistaken as to the action of these compounds on the steel.

In my article on "hardening steel" I spoke exclusively of steel used for tools, and this class of steel is supposed to contain from 0.6 to 1.5 per cent. of carbon. It is an accepted fact that the amount of carbon in the steel determines the degree of hardness attainable at the same point of heating and subsequent cooling, since steel containing less than 0.25 per cent. of carbon cannot be hardened by the usual process. If we take two pieces of steel, one with the minimum and the other with the maximum amount of carbon, heat them to the same degree, and cool them off in water of the same temperature, we shall find that the piece containing the most carbon is the hardest and much more brittle than the other, and by drawing the temper and stopping at the same color, we find the same difference still remaining. Having tried a great many different kinds of steel in order to find one brand or make that could be hardened always under the same conditions, for purposes when it was absolutely necessary to obtain the same temper, I found that it was impossible to follow the same routine always, and this prompted me to look for some means to prepare the steel before hardening, so as to prevent it from becoming brittle. For this purpose I use certain materials which steel makers call "fluxes." I never give the steel a high heat, never beyond a bright red, just enough to insure hardness, and for ordinary purposes, such as turning, planing and milling tools, I find it unnecessary to draw the temper even of tools made of the very finest of tool steel.

As to joining the atoms of carbon and steel: Analysis shows that in burned steel and cast iron the carbon is separated from the iron and presents itself in the form of graphite, while in good steel it is closely united with

the iron. By experimenting with burned steel and by using the compounds again, I found, that even at a low heat this separation of the carbon from the iron has disappeared, the fracture presenting the same grain as in good steel, especially if the process had been repeated twice or three times, and from this I deduced that the compound had acted in some way as fluxes do when steel is melted or welded. If I am wrong, I shall be glad to be told where I am erring; it may help me to obtain further light on this very vexing question of how to harden steel properly.

In conclusion I wish to draw the attention of Mr. Goodyear to a contradiction he allows to appear in his article. He says that when two pieces of steel are heated and cooled off, one in cold water the other in oil, "the piece hardened in oil is tougher and shows a finer grain than that hardened in water." And just below: "Then oil is the best, is it not? As a necessity for producing the greatest toughness, hardness and fineness of grain. No."

FLUX.

NEWARK, N. J.

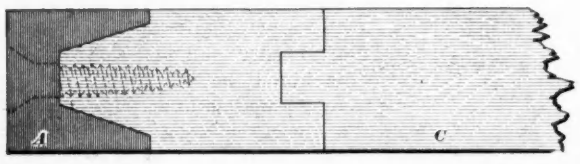
Drawing Boards and T Squares.

Editor American Machinist:

Experience has shown that it is both expensive and useless to keep a drawing board perfectly square on its four edges, for one straight end is all that is needed, by using large triangles with the T square.

I have a plan by which my drawing boards have one straight end, and one that will always keep straight, which is, to have a piece of cast iron planed perfectly straight, and screwed to the end of the board, as per sketch.

The cast iron piece *A* is planed all over, the outer edge being made perfectly straight.



This iron edge is held in position on a strip of wood, running crosswise of the board by screws. The drawing board proper, *C*, is tongued into the cross piece; by this arrangement all allowance is made for shrinkage, and drawings can be placed on either side of the board. With ordinary care a drawing board like this can be kept in perfect shape for years. I have a board in the draughting room made after the above plan, which has been in constant use for over eleven years, and is in good condition now, although not a cent has been expended on it since it was first made.

I also have a style of T square which works very well, and may be of interest to your readers. The blade is made of well-seasoned wood, but the head is of cast iron, made as light as is consistent with proper strength, the edge of the head being made perfectly straight. It will be seen that this combination of a straight iron edge on the board and iron T square head will make a very accurate drawing. The iron T square head has another advantage, for the weight keeps it from sliding about; of course, the head should not be too heavy, but just heavy enough to keep the blade in position.

Another little improvement I have introduced is to make the blade of T square removable, so that we can use a long or short blade in the same head, thus suiting the length of the blade to the size of drawing board.

It also allows the blades to be trued up with ease, and when placed in the head again can be set exactly at right angles to it.

FRANK H. POND.

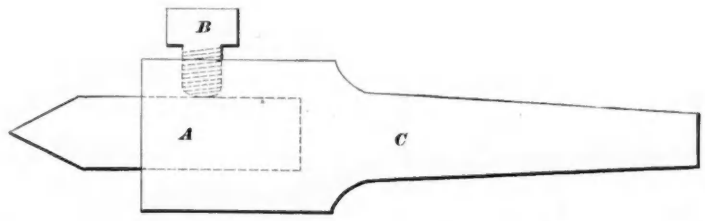
St. Louis, Oct. 11, 1881.

A Square Center.

Editor American Machinist:

I send you a pencil sketch of a more convenient form of square center than that now in general use.

This form reduces very much the grinding surfaces, as the piece of steel which forms the square center is greatly reduced in size from the ordinary square center. *C* is a socket, one end turned taper to fit the lathe, the other end drilled to receive a plain piece of round steel. *A*, which forms the square center. *B* is a set screw for holding it. It is easily removed for grinding, and is easily renewed when becoming too short. It is seldom that the sharpened point of a square



center is used half its depth, or even a third, but when it becomes dull the whole length of point must be ground to preserve the angle; so the advantage of a smaller point is readily seen.

I first saw the changed form in H. F. & John Barnes' shops at Rockford, Ill.

H. C. B.

Hudson, Wis.

Shop Kinks.

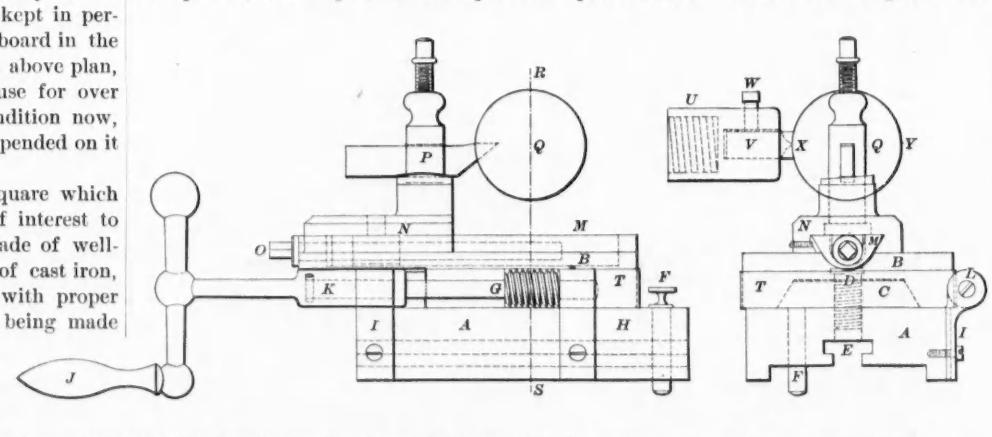
No. 20.

BY L. F. LYNE.

A HANDY LATHE APPLIANCE FOR TURNING SPHERES AND OTHER SHAPES.

While engaged in a railroad shop, it was desired to make and use some ball check valves. The valves we contemplated using were a sort of experiment, therefore, it was not deemed expedient to go to the expense of a special machine for the purpose of turning balls, so I made an appliance represented by the accompanying engraving.

It was intended to be applied in place of the slide rest to a "Fox" lathe used for brass work. This appliance consisted of a cast iron base *A*, having a conical shaped projection *C*, upon the top. The bottom was planed, with lips to fit the plate for



holding the slide rest, and was held by a bolt in the slot *E*. This slot extended from end to end of the plate *A*. A worm wheel *B*, $5\frac{3}{4}$" in diameter, was neatly fitted to the conical projection *C*, so as to move freely without lost motion, and was held in position by the bolt *D*. The teeth in the worm wheel were cut with a hob having 6 threads to the inch. The worm *G* was 1" in diameter, made and supported by the journals *I* and *H*, as shown. The tool rest *N* having a tool post *P*, was made to fit the slide *M*, upon the upper face of the worm wheel, and was operated by applying a handle to the square *O*, upon the end of a screw.

The ball *Q* to be turned when of solid metal had a neck *V*, cast upon it. If it was to be hollow the neck was screwed in hot, the surfaces having been previously tinned. The ball was held firmly for turning by being placed in the socket *U* (screwed fast to the lathe spindle), and tightening the screw *W*. To turn a sphere perfectly round its center must be directly over that of the worm wheel, as shown by the dotted line *R S*. When one sphere had been accurately turned, a hole was drilled for a steady pin *F*, which enabled the workman to set the appliance to turn a true sphere at a moment's notice. The worm wheel was operated by turning the handle *J*, which had a socket to slip over the end *K*, of the worm shaft. A round pin passed through the socket and fitted a slot in the end of the worm shaft, which prevented it from turning in the socket. A strip of iron *T*, $\frac{1}{16}$" thick covered the worm wheel and excluded the chips. The worm was also covered. In starting a cut begin at Y and run around to X. When the ball has been turned to the exact size the neck is to be cut down as shown by the dotted lines at X when it will drop off. A concave surface may be turned by removing the pin F and shoving the plate A to the left, and a convex surface may be turned by moving it to the right. In other words in the former case the center of the worm wheel must be to the left of the dotted line R S, while in the latter it must be to the right, and when the centers of the worm wheel and ball coincide, a perfect sphere is the result. It is possible that some will say that such an expensive appliance as this will be economical only for special work and that it would not pay for general purposes. All I have to say that this one has been in almost constant use in a railroad shop for over five years in turning oil cups, balls and all kinds of brass work. Its first cost was not to exceed $15, and it is now considered one of the indispensable tools in the shop where it is used.

A New Transmitting Dynamometer.

The want of a dynamometer adapted to be placed on any shaft in an industrial establishment, and so constructed as to accurately determine and automatically register the power transmitted, has been long felt. Such an instrument, in order to answer the requirements, must be simple in construction, or at least sufficiently so, to be comprehended by any one of ordinary intelligence. It must also be susceptible of being tested at any time, in such a way as to verify the accuracy of its record, and must be of such general form and construction as to occupy the place of an ordinary pulley on the shaft.

The utility of such an instrument is too obvious to need extended comment. Manufacturers are unable to inform their customers of the power required to drive their machines and machinery, so that in this respect, while able to guarantee the performance in the way of quantity of work and general behavior, they can only give an approximation, which really amounts to a guess, of the power their customer will have to furnish. Again, parties who are interested in the operation of machinery, by being able to measure the exact power required to drive it, and comparing this with the consumption of different kinds of coal, are at once enabled to fix upon what will be for them the most economical fuel, while similar comparisons will as readily determine the value of different lubricants.

Such a device is also invaluable for determining the power supplied to the different tenants of those who furnish power in this way. In fact, without further particularizing, the uses of an accurately registering transmitting dynamometer are apparent to all who are in any way interested in the transmission of power.

The engravings presented on page 7 represent a new transmitting dynamometer, which is said to meet, in a thoroughly practical manner, the demands for such an instrument. It is adapted to be placed upon any shaft—either the driver or the driven—occupying the same space as an ordinary pulley, which it takes the place of, and when thus mounted will go on recording the exact power transmitted for any length of time, without requiring winding up or other attention; or when this is not desirable it may be left to perform the simple functions of an ordinary pulley.

An examination of the engravings—representing two views of the device—show that the mechanism is all contained inside the rim of what appears in other respects an ordinarily constructed pulley. By reference to the following description, its operation may be understood:

A and *B* are radial arms, one of which is fitted and fastened to the hub of the pulley, while the other is fastened by a key or set screw to the shaft, These arms are provided at their extremities with sockets adapted to receive the springs *D D*. Either of these arms may be the driver, and the other will be driven through the intervention of these springs, which will be thereby compressed in a degree corresponding to the power transmitted. It will at once be seen that it is only necessary to indicate in some legible manner the extent to which these springs, which are of a known and definite strength, are compressed to determine the exact power being transmitted.

This is accomplished as follows: In the radial arm, which is fast to the shaft, is a stud which carries the pencil arm *G*. This arm, being pivoted to the inner periphery of the pulley rim, it will be obvious that, as the springs *D D* are compressed, the relative motion of the radial arm will cause a corresponding motion of the pencil arm, which will cause the pencil *F* to be moved across the face of the disc *H*, to an extent corresponding to the compression of the springs.

On this disc is arranged a circular card, which is graduated by a series of concentric circles, each circle or line representing a definite horse power. Each circle is marked with the horse power which it represents, and also with the number of pounds the belt must pull to bring the pencil to this line, this latter rendering it an easy matter to test the accuracy of the device at any time. The outer circle on the card is the zero line, and the pencil is moved towards the center, vibrating with the amount of power transmitted, and at any instant assuming the exact position due to that power. This disc is made to revolve under the pencil by means of the differential gears *J*, operated by the bar *L*, which projects slightly through the rim of the pulley, and, in being alternately under the condition of pressure and release from the belt, is made to communicate motion to the wheel train just noticed.

The actuating mechanism is so arranged that the disc may be made to revolve once in a month, week, day or hour, being adjustable in this respect.

From the foregoing description it will be readily understood that the simple mechanism of this dynanometer may be furnished in a pulley of almost any required diameter; and to register from the fraction of a horse power up to any power required, marking upon the card a continuous diagram, which may be removed at monthly intervals or as often as is desirable, and a new one substituted. From the card removed, the horse power at any time in the interval may be instantly read.

All parts being within the pulley, the whole apparatus is self-contained, and can be as readily attached to a shaft as an ordinary pulley.

This dynamometer is the invention of Hamilton Ruddick, of Brooklyn, N. Y., and is manufactured and sold by the Transmitting Dynamometer Company, 71 Astor House, New York.

The Influence of Time on the Pencil Movements of the Indicator.

BY F. F. HEMENWAY.*

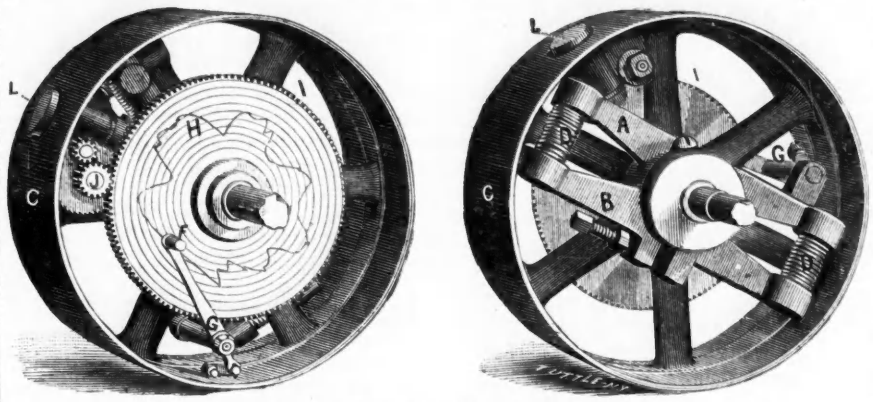
When engines of high rotative speed became common, a difficulty was experienced in obtaining from them satisfactory indicator diagrams, which was only overcome by radical improvements in the indicator itself. That the difficulty was one of time of rotation and of piston speed seemed too plain to be disputed, since the putting in motion and bringing to a state of rest a mass of inert matter, represented by the piston, spring, pencil movement, etc., 600 times in a minute must necessarily be more difficult than doing the same thing 300 times. In all discussions of the matter I do not remember to have seen it referred to in any other than what would seem to be this legitimate way.

Coming to a consideration of the question of time, if we take an engine running at, say, 600 revolutions per minute, and use a spring of a tension represented by 1½″ pencil movement, it will be seen that, if the pencil begins its upward motion exactly at the commencement of the stroke, and at the termination of a single stroke has subsided to its initial position, it will travel 3″ in the $\frac{1}{1200}$th part of a minute, reversing the direction of its motion once in the time. In other words, if its velocity was uniform it would travel at the rate of 300 feet per minute. When it is considered that this implies the compression and distension of a spring, in effect 1,200 times in one minute (since under the conditions assumed it would remain inactive one-half the time), some idea of the difficulties in the way of indicating engines at such speeds may be appreciated. This consideration of the subject is on the assumption that the pencil occupies for its upward movement time which is represented by the movement of the crank through 90°, or ¼ of its revolution, and that the corresponding downward movement occupies the same time — conditions that do not necessarily nor generally exist.

In any event, it would appear reasonable that if the revolutions were reduced to 400, the reduction would have a marked influence in determining the character of the lines of the diagram so far as smoothness was concerned; but to demonstrate that such a conclusion is not necessarily correct, as well as to show the influence of different conditions in the same engine, two diagrams are appended, both taken from a 5″x7″ engine at the speeds indicated upon them.

Referring to the diagrams; it will be noticed that the one taken at the least number of revolutions, was also taken with a spring of the highest tension—two substantial reasons why it should be the smoother of the two. In point of fact, however, it will be seen that while this one will be recognized as a first rate diagram to be taken at 400 revolutions, there are plain evidences of the shock imparted to the reciprocating parts of the indicator by the sudden action of the steam at both admission and exhaust, while the one taken at 600 revolutions, and with the lightest spring, shows only those pleasing undulations that are properly taken as representing almost perfect action of the indicator.

In order more clearly to show the reason of this a circle has been described on each of the diagrams, which may be taken to represent the path of the crank pin, and lines have been drawn to represent the periods in which the more prominent of the pencil movements occur. From these, the reason why the diagram at 600 revolutions is the smoother of the two may be readily seen. Thus the points where the dotted line touches the circle in the last mentioned diagram, representing the portion of the entire revolution of the crank during which, by the operation of compression and admission (or more properly by compression alone), the upward movement of the pencil took place, embrace 129°; and since the total time of a revolution is $\frac{1}{600}$ = 0.00166 minutes, the actual time during which the pencil was rising the distance shown was: 360° : 129° :: 0.00166 : 0.00059 minutes.



Referring now to the diagram at 400 revolutions, the corresponding upward movement was made while the crank pin was traversing 48° of its orbit, and the time of an entire revolution being $\frac{1}{400}$ = 0.0025 minutes, the time occupied in this movement is 360° : 48° : : 0.0025 : 0.00033 minutes.

In other words the intensity of the shock to the reciprocating parts of the indicator is nearly twice as great in the instance of the slower speed as in that of the higher; and in the one instance the upward motion of the pencil has occurred while the crank was making less than one-seventh of a revolution, while in the other the corresponding movement occupies the time of more than one-third of a revolution. Further comparison will show that in the lower speed diagram the downward movement of the pencil was made in much shorter time than in the higher speed one, and, taken altogether, the two will show conclusively that the number of revolutions and the piston speed are only two of several factors that enter into the problem of indicating high-speed engines.

It seems hardly necessary to say that the engine from which these diagrams were taken was fitted with a single valve, moved by an eccentric which was shifted by the operation of the Governor.

It is proper, however, to state that the somewhat excessive back pressure shown on the slower-speed diagram, was due to the presence of an experimental nozzle on the exhaust pipe.

* The writer is indebted to Mr. Harris Tabor, of Hartford, Conn., for the argument of this article, as well as for the diagrams accompanying it.

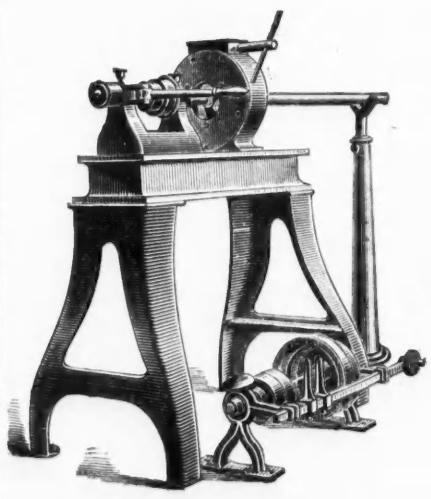
A NEW TRANSMITTING DYNAMOMETER.—See Page 6.

New Centering Machine.

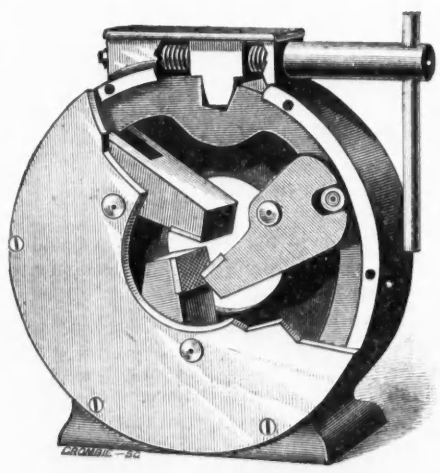
The accompa g engraving represents a centering machi ecently brought out to meet the demand for a first-class machine, capable of accurately and quickly centering both heavy and light work, and of retaining its accuracy under the usual strain to which this class of machines are subjected. The inventor, Mr. A. F. Hyde, of Boston, Mass., has designed a chuck especially for this purpose, the operation of which will be readily understood by aid of the cut, which shows the front plate partly broken away. It will be seen from this that the jaws, which are very wide and heavy, are firmly supported on both sides. A steel stud ¾″ diameter passes through the jaw and each side of the case. The jaws are faced with the best quality of tool steel and thoroughly hardened. In holding stock of different sizes, the chuck is so constructed that the line of contact of the jaws moves from a point near their ends toward the fulcrum studs, as the work to be held increases in diameter, thereby giving greater leverage and holding power for heavy work, and distributing the wear over the whole surface of the jaws. Another important point in securing the continued accuracy of this chuck lies in the fact that the wear of the screw does not in any way affect the accuracy of the jaws. This will be readily seen by an inspection of the engraving.

The drill spindle slides through the cone, and is operated by a lever having a toothed segment connected through a pinion with a rack cut on the box which slides in the head stock. This gives a quicker and much more desirable feed to the drill than the ordinary screw feed. Both bearings of the live spindle are large and long, and made of the best hard bronze metal. The workmanship and material are first class. The machine will center all sizes of round stock from ⅛″ to 4½″, and is provided with an adjustable stand for supporting long bars. We are informed that these machines are now in use in a large number of the leading shops in New England, and that they are giving excellent satisfaction.

Manufactured by Warren Haskell & Co., 36 Charlestown Street, Boston, Mass.



NEW CENTERING MACHINE.



CHUCK OF CENTERING MACHINE.

A Japanese inventor is said to have succeeded in making a rifle of silk that possesses all the advantages of an iron or steel piece with only a fraction of the weight.

American Institute Fair Notes.

A new direct acting steam pump is exhibited by the Delamater Iron Works of New York City. Its operation is very smooth and regular. Capt. Ericsson's hot air pumping engine, of which large numbers have been sold, is also shown by the same establishment, and excites a great deal of admiration.

P. Pryibil, New York, makes a very creditable exhibit of improved wood working machinery.

T. F. Rowland, Greenpoint, N. Y., shows some very large hydraulic forgings. Some of them are oval-shaped and hollow.

Allen's Pneumatic Riveting Machine is shown in operation.

The usual cider mill in the machinery department grinds out its mild beverage which is dispensed to thirsty visitors at 5 cents a glass.

Several stone crushers are busy crushing up rocks and scattering dust over the adjacent exhibits.

The Almond coupling, for transmitting power from the end of one shaft to another, at right angles, and in the same plane, is also exhibited in operation by T. R. Almond, 84 Pearl Street, Brooklyn, N. Y. The above coupling was illustrated and described in the AMERICAN MACHINIST, February 26, 1881. It attracts a great deal of favorable notice.

Dr. Gehring, of Bavaria, has succeeded, we are informed, in producing an enameling fluid by the use of which any kind of stone or cement may be made harder than granite, and which will also effectually prevent iron or steel from rusting.

A monthly publication in this city having the word "export" in its title is very industriously engaged in abstracting articles from the AMERICAN MACHINIST and printing the same without credit, as though they constituted part of its own original matter. If the editor of that sheet is troubled about finding enough to "fill up" his columns we should prefer to loan him a few articles that have not been published, rather than witness such a strain upon his gutta-percha conscience.

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NEW YORK, NOVEMBER 5, 1881.

CONTENTS.

	PAGE.
The New Hartford Automatic Engine	1
An Opportunity for Boys	2
Counter-Balancing of Engines and other Machinery Having Reciprocating Parts. By S. W. Robinson	2
Manufacturer's Bench Drill	4
Heavy Key Seat Cutting Machine	4
Moulding Gear Wheels in Dry Sand or with Cores. By Thomas D. West	4
Brain Power and Machine Work	5
Improved Horizontal Tubular Steam Boiler	5
Letters From Practical Men—Swaging Boiler Flues—To Temper the Ends of Steel Rules—Hardening Steel—A Square Centre—Drawing Boards and T Squares	6
Shop Kinks. No. 20 By L. F. Lyne	6
A New Transmitting Dynamometer	6
New Centering Machine	7
The Influence of Time on the Pencil Movements of the Indicator. By F. F. Hemenway	7
American Institute Fair Notes	7
The Coming Tariff Convention	8
Changes in Machinery Business	8
Annual Meeting of the Mechanical Engineers	8
The Cost of Iron Castings	8
Literary Notes	8
Questions and Answers	9
Manufactures	9
Newly Incorporated Companies	9
Machinists' and Engineers' Supplies	10
Iron and Metal Review	10

The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

The Coming Tariff Convention.

The most important movement towards amending the present schedule of duties on imports that has been started since the adoption of the protective tariff now in force, is the calling of a national convention of the agricultural, manufacturing and commercial interests of the country in New York city, on Tuesday, the 29th of November.

There are to be about 600 delegates apportioned among the various industries of the country, also a hundred additional delegates from New York city, besides the signers of the call, to participate in the proceeding of the convention. Large industrial associations will be allowed 25 delegates, and the smaller ones ten each. It is not easy to foresee how far the different industrial interests represented at this meeting will agree upon proposed changes in the tariff, but it may perhaps be safely assumed that they will unite in a petition to Congress for the appointment of a tariff commission, composed either wholly or in part of manufacturers and business men. If such a commission should be appointed, it is expected that a year or two will be passed in taking testimony on tariff matters before any actual revision is made. It would necessarily require considerable time to allow the various industrial interests to be heard to their satisfaction, and it would manifestly be unjust to act precipitately after the whole tariff had once been laid before the people for suggestions regard ing a general revision.

There are various anomalies in our tariff which both protectionists and free traders are desirous of having righted. The rates of duties, however, constitute a very large bone of contention.

The new movement is likely to bring the principle of protection to home industries more closely to the attention of the whole people than it ever has been before, which of itself cannot fail to prove beneficial. A greater public interest will be awakened in our manufacturing industries. Even the great daily newspapers may, by the logic of events, be constrained to allow some small portion of their attention to be diverted from the fortunes of political acrobats engaged in incessant scrambles for offices, to chronicling industrial matters, such as nine-tenths of their readers are occupied with every day.

An impression has gained ground in some sections of the country not specially engaged in manufacturing that protection is alone beneficial to manufacturers. This idea can be proved fallacious when the question is thoroughly dissected. Protection benefits not only the manufacturer but the whole community, employers and employed, where protected enterprises exist. Localities where manufactures do not exist are also benefited by their progressive operation in other parts of the country, so mutually are we dependent upon each other for business success.

Efforts are being put forth to make this convention a representative body, whose conclusions shall be entitled to much weighty consideration.

Changes in Machinery Business.

At no time in the history of the machine industry of the country has the tendency to divide up the business, been so great as at present. Large shops are devoted to a single ine of manufacturing, that years ago would have spread their energies over almost everything in the way of machinery. It has come to be understood that special tools provided for specific purposes cannot profitably be kept idle, as well as that manufacturing to be profitable must be done largely by the aid of tools designed and arranged especially for particular purposes. Many large establishments will have nothing to do with repairs, and many others buy largely of work which at one time they were in the habit of doing for themselves.

It was argued a few years ago that the impending concentration of machine business would tend to crowd small concerns out of existence, but the fact would seem to be that there is as much room as ever for small shops if they work in the right directions. Accurate means of measurement make it possible for them to manufacture individual parts of machines and machinery, and thus they are enabled to employ special tools and appliances for special work instead of trying to do a great variety, with tools common to the whole and special to none of it.

Annual Meeting of the Mechanical Engineers.

The rules of the American Society of Mechanical Engineers designate the first Thursday in November of each year as the time, and New York City as the place for holding the annual meetings of the Society. On Thursday, November 3rd, next, therefore, the second annual meeting will be held.

The Secretary has issued a circular designating 3 P. M. as the hour for assembling, and the Union League Theatre, 26th Street and Madison Avenue, as the place for the forthcoming meeting. A list of places of interest for members to visit will be exhibited in the hall. The Society has made large and significant gains in membership since the first annual meeting, and, including those on the pending ballot list, has now about three hundred names on its membership roll.

The hall chosen for the forthcoming meeting will be remembered as the same that was used a year ago for the First Annual Meeting. Its convenience was then so generally acknowledged as to make it the first choice for this occasion.

Ladies desiring to attend the sessions of the Society will be welcome.

The interesting nature of the proceedings, and the general appreciation of the character and growth of the Society, together with the exceptionally low railroad fares now prevailing, will doubtless combine to insure a large attendance.

A Subscription Dinner for those who desire to take part in it, is arranged for Friday evening, November 4th, at Delmonico's, at which it is understood ladies are expected to be present. This is not to be regarded as any part of the regular proceedings of the Society. The work to which the Society devotes its energies as a body, consists in the reading and discussion of papers, and, in general, the consideration of mechanical topics, as presented by the membership.

As the most important means of carrying out the principal object of the Society, namely, "to promote the Arts and Sciences connected with Engineering and Mechanical Construction," by bringing the papers and discussions prominently before the mechanical public, at large, it is proper to state, that every paper and memorandum presented to the Society at any of its meetings thus far, has been published entire in one or more technical journals in this country, in the order designated by the author, besides which, a number have been published in leading foreign journals.

The Cost of Iron Castings.

When an individual, a firm or a company runs an iron foundry without a machine shop, or a boiler shop, or any other like attachment, it is very easy to determine just what it costs per pound to make iron castings. Again, when the proprietor of a shop buys all his castings, he knows to a certainty what they cost. But when an establishment consists of a foundry, a machine shop, and perhaps two or three other departments, the probabilities are that no accurate account will be kept of the actual cost of iron castings. The proprietor must of necessity know what are the net results of his work, but where a mixed business is carried on there is no way to know exactly what castings cost, or what machine work costs, unless a separate record of every element of expenditure is kept for each department. A large portion of shop owners are satisfied if the establishment is making money upon its aggregate business, without bothering themselves about probable elements of loss.

Relative economies are overlooked when a fair exhibition of general economy is apparent. Thus it often happens that concerns making their own iron castings pay more per pound for what they use, all elements being considered, than the same could be procured for on contract with some neighboring foundry. Tell them that this is the case and they will not believe it. Sometimes a shop of this kind takes an order for a lot of castings for outside parties at what is considered a fair price, and makes the unpleasant discovery when the order is executed that there is no profit but on the contrary a loss in the transaction.

The effect of such an event upon the business habits of the proprietor is apt to be salutary.

It is often decidedly cheaper to buy castings, even in large quantities, than to conduct a foundry and make them.

Literary Notes.

THE MOST ECONOMICAL POINT OF CUT-OFF IN STEAM ENGINES: A DETERMINATION OF THE BEST RATIO OF EXPANSION OF STEAM IN ENGINES. Presented by Alfred R. Wolff and James E. Denton. Weightman & Wolff, engineering experts, 85 Astor House, New York.

The above pamphlet consists of two papers read before the American Society of Mechanical Engineers. The first one was read at Hartford, Conn., and the second at the Altoona, Pa., meeting.

These papers take up the subject of the most economical point of cut-off of steam in steam engines according to new light, by a consideration of the first cost of machinery, cost of running and maintenance, depreciation in value, interest on plant, and, in fact, all the practical arrangements that require an expenditure of money as affecting the question at issue. The papers are fully illustrated by diagrams and tables. The reasoning is good, notwithstanding some of it has been sharply criticised by some of the older engineers. They ought to be extensively read and considered by those interested in the building and using of steam engines.

The Atlanta Exposition has not got into full working order yet. It will take about a week longer to get all exhibits in place. The catalogue has just been issued.

We present this week part of a paper read by Prof. S. W. Robinson, chief of the Department of Mechanical Engineering of the Ohio State University, on Counter balancing of Engines. The paper, which is a particularly valuable one, has been revised for our columns by Prof. Robinson, the higher mathematical formulas omitted, and the computations reduced to arithmetical operations. The remainder of the paper will appear next week.

Philadelphia is exercised over the recent discovery that the law requiring fire escapes on all buildings occupied by a large number of persons is systematically avoided. It turns out that on the plea of economy the authorities had failed to designate an official to see that the law was enforced, and the recent horrible mill calamity was required to bring them to a sense of their duties. There ought to be some means by which to designate the crime of penning up three or four hundred operatives—particularly women and children—without means of escape in the event of fire. It would probably be too much to ask for the punishment of the guilty parties in such cases.

We regret to hear of the recent death of John T. Hancock, an inventor of more than usual ability. When young he served a short apprenticeship to the carpenters' trade, and afterwards to the trade of stair building; but as his mind was naturally inclined to machinery, boilers, engines, and their belongings, he quit wood working after pursuing it for a brief season, and gave his attention to experimenting with steam and air. His most important invention was the Hancock Inspirator, an instrument that in its operation astonished some of the most expert engineers. All his inventions were worked out by careful study and experiment, not come upon by accident. He was a quiet, unobtrusive generous man, who leaves a wide circle of friends.

Boston is still anxious to have a World's Fair held in that city in 1885. The conclusion has been reached that if $5,000,000 can be previously raised by subscription the fair can be held. It will take a few weeks yet to decide the financial question.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(1) H. N., Bernardston, Mass., writes: I am in some doubt as to the best kind of bearings for an engine lathe, the live spindle bearings I mean. The spindle must be of good steel in all cases. The common bronze box looks well, and is very good; but it wears rather fast. Hardened steel is expensive, and some say not quite the thing for all kinds of work and workmen. Babbitt I set aside as too soft, etc. Some use cast iron, and some say it is too liable to cut the spindle. Is phosphor bronze much better than common bronze? Another thing: What form or style of box is best? Round or tapering, or the common style let into a square recess in the head? *A.* We believe bronze, all things considered, is usually thought to be the best for lathes of moderate size. We have seen excellent results, however, from the use of cast iron; and under the care of a careful workman we doubt if it is not equal to anything used. Phosphor bronze is not as yet meeting with especial favor for bearings, and we question whether, for the purpose named, it is any better than good ordinary bronze. Individually, we believe a box let into the square recess is the best.

(2) S. A. B., Cleveland, O.: We had an argument in the shop in regard to the proper way to fit keys. I claimed that a key should just fill up and down and fit tightly sideways, and that a key fitted in this way would hold just as well as if fitted tight up and down, and be less liable to throw the piece keyed out of truth with the shaft. There were three or four against me, who claimed that a key should just fill sideways and fit tightly up and down. Which is right? *A.* Theoretically you are right. In all cases where the piece is properly fitted the key should be an easy fit up and down. It often happens, however, that one has to key some piece to a shaft to which it is improperly fitted. In this case there seems to be no other way than to fit the key in such a manner as to draw the piece into contact with the shaft as much as possible, otherwise there will be nothing but the side contact of the key to hold it from shaking loose.

(3) C. M. H., Hudson, Mass., writes: I have two shafts, one driven by the other, and transmitting about 35 horse power. The pulleys on these shafts are 24″ diameter, and will not transmit the power without constant slip of a 12″ double belt. What I would like to know is: 1. If I use 4-foot pulleys, what per cent. power will I gain, if any? *A.* At such speed as we should infer you run your shafts, the gain will be about 100 per cent. That is, retaining the present 12″ belt, you can transmit 35 horse power over the 4-foot pulleys as easily as 18 horse power over the 24″ pulleys. 2. If I use a double belt 15″ wide, what do I gain over a 12″ (double) belt? *A.* 25 per cent. 3. In substituting the larger pulleys and belt, do I save anything in the wear of belt? *A.* Yes. With the large pulleys your belt would not slip or require to be laced so tightly, and should last two or three times as long.

(4) R. W., New York, writes: Being a constant reader of your valuable paper I would like you to oblige me by giving me information on the following subject: 1. Whether the Commissioners of the Erie canal have ever given the premium that was offered some years ago for a steamboat that would not wash the banks? *A.*—A part of the premium was awarded at the time. At the present there is no premium offered that we are aware of. 2. What is the most direct way to communicate with the Commissioners. *A*—The office of Canal Commissioners was abolished in 1878.

(5) J. R. C., Gloucester, N. J., asks: Will you kindly inform me if there are any papers in the United States that publish contracts and specifications for machinery, especially heavy machinery? *A.* There is no paper devoted to such publications. 2. Can you inform me of any companies likely to want such specifications? *A.* You will find in the AMERICAN MACHINIST the names and location of newly incorporated companies. By writing them you can find out if they have any such needs.

(6) A. S., Chicago, Ill., writes: Please say if you know who makes a machine that drills square holes. *A.* To the best of our knowledge there is no such machine manufactured. As a matter of curiosity a jig has sometimes been attached to a common drilling machine, so as to produce with a drill an approximation to a square hole, but we doubt if the device has any practical value.

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"Paragon" Metallic Piston Rod Packing. See AMERICAN MACHINIST, July 16th, 1881. Write for prices. A. Wilkinson, Manayunk, Philadelphia, Pa

A New Treatise on Steam Engineering, Physical Properties of Permanent Gases and of Different Kinds of Vapor. By John W. Nystrom, C. E., 8vo., cloth. Price, $1.50, also A New Treatise on the Elements of Mechanics, Establishing Strict Precision in the Meaning of Dynamical Terms. By John W. Nystrom, C. E., 8vo., cloth, price. $2.00, Mailed by E. & F. N. Spon, 446 Broome St., New York City, on receipt of price.

MANUFACTURES.

Goorge H. Whitney, Nashua, N. H., is building two 18-ton lathes for the Union Pacific Railroad.

It is reported that the Appleton Company of Lowell, Mass., contemplate building a new cotton mill.

The Nashua Steam Press and Boiler Works, Nashua, N. H., have added some new shops to their works.

The National Boiler Works, Chicago, Ill., have commenced the construction of a new shop 60x132 feet.

The Cuyahoga Works, of Cleveland, O., are building a Seven Hundred H. P. Compound Engine (Tandem Style) for a large Chicago grain elevator.

The Westinghouse Air Brake Company's buildings at Allegheny, Pa., are being rapidly pushed to completion. An extra relay of men are working at night by the aid of electric light.

Lowe & Watson, Bridgeport, Conn., have orders for boilers several months ahead. Several of the boilers ordered are to be fitted with the Lowe heaters.

The foundation for a print mill to contain 30,000 spindles will be laid this fall at Globe village, Mass. The capital stock of the company is $400,000. Mr. William Henry is chief engineer.

Grant & Bogert, Flushing, N. Y., have started to build a foundry 50x50 feet, as an addition to their machine tool works. They will soon be ready to deliver lathes to customers.

The Atlas Engine Works, of Indianapolis, Ind., have been awarded the first premium and gold medal, for the best Slide Valve Engine on exhibition at the ninth Cincinnati Industrial Exposition.

The Saginaw *Herald* says that a large factory for making freight cars will soon be established at East Saginaw, Mich. We are unable to learn the names of the parties to the enterprise.

Dwight Slate, Hartford, Conn., is crowded with orders for his light-running machine tools, such as drills, gear cutters, milling machines, etc. He will soon add other specialities in the way of tools to his list.

Norris Brothers, Rushville, Ind., have broken ground for a large drill factory, which, when completed, will give employment to about 150 men, their old works being wholly inadequate for their rapidly increasing business.

Si. Alger & Son, Rushville, Ind., are building a new flouring mill to be eight run. The Atlas Works of Indianapolis, Ind., have the contract of furnishing them with a Corliss engine. To be fitted with new process machinery.

The Allen Riveting Machine Co. have just received an order from the Delaware Iron Works, Chester, Pa., John Roach, for two of their portable Compression Riveters. They have above eighteen of these riveters in operation in different bridge building works.

The Atlas Engine Works, of Indianapolis, Ind., are putting in, at the present time, Corliss engines as follows: 20″ x 48″ for J. M. Stewart & Co., Carlyle, Ill.; 18″ x 42″ (condensing) for T. M. Sinclair & Co., Cedar Rapids, Iowa.; 18″ x 42″ for New Orleans Electric Light Co.; 18″ x 48″ for the Indianapolis Electric Light Co. and a 16″ x 42″ for Batty Bros. & Boynton, Waverly, Ill.

A. L. Crocker, who has for some years been connected with large Eastern machine shops, and who assisted in building one or more Bessemer steel works, is establishing himself in the machine business in Minneapolis, Minn., for the purpose of doing general jobbing, and for the manufacture of small engines and special machinery.

We understand that the Allen Riveting Machine Company are now building a stationary steam riveter of 72″ reach, in which a 12″ cylinder, with a boiler pressure of fifty pounds of steam, will produce a pressure upon the rivets of from forty to fifty tons. Another very great feature of this riveter will be a new invention of Mr. Allen, whereby the plates will be pressed together before and during the operation of forming the rivet head by a pressure of about ten tons, capable of being increased or diminished.

The works of the Hartford Engineering Company at Hartford, Conn., covering about six acres of ground, are now complete, and have a capacity in the way of steam engines of 25,000 horse-power yearly. They are outfitted with a complete plant of new tools from the works of William Sellers & Co., David W. Pond, Frederick Miles, the Niles Tool Works, Brown & Sharpe, Pratt & Whitney, Morgan & Williams, Wm. Warren, etc. William Lee Church and Geo. A. Barnard are the engineers of the company, and Harris Tabor is the general superintendent.

E. P. Bullard, 14 Dey Street, New York, has fitted up a shop in Bridgeport, Conn., which is known as the Bridgeport Machine Tool Works, for the purpose of building the style of lathe illustrated and described in the AMERICAN MACHINIST of October 1, 1881. Mr. Bullard has given up the steam engine business altogether for the purpose of building and selling strictly first-class machine tools. He has already built sixty-three of the style of lathes alluded to, fifty-six of which are in use, and finds it very difficult to get a stock on hand on account of numerous orders.

T. H. Sutherland & Son, proprietors of the Franklin Iron Works, Troy, N. Y., who sustained the loss of a $100,000 fire, with very little insurance, something more than a year since, have a new building costing about $80,000 nearly completed on the site of the one destroyed. They are at present employing about 100 boiler makers, and are completing several large contracts, amongst others three new ovens for the Crown Point Iron Co., making six altogether. These ovens are 17 feet in diameter and about 75 feet high. They are also doing a variety of other work for this company; building six boilers for the Bay State Iron Company; new boilers and general work for the Burleigh Iron Company. Amongst the work for the iron companies mentioned has been a number of large gas flues and general furnace repairs.

Newly Incorporated Companies.

NEW YORK.

The Kennedy Brick and Tile Machine Company, New York; Francis J. Kennedy, Geo. W. Phelan, Addison C. Jackson, Charles E. Kimball and J. W. Lawton, corporators; Capital, $50,000. To manufacture and sell machinery for manufacturing bricks and tiles.

Levett-Muller Electric Light Company, New York; Alex. Levett, Hans J. Muller, Louis Levett and Gilbert E. Coles, corporators; Capital, $1,000,000. To manufacture and sell apparatus to be used in producing light, heat and power by electricity.

Levett-Muller Ore Separating Company, New York; Alex. Levett, Hans J. Muller and Louis Levett, corporators; Capital, $200,000. To manufacture, own, sell and operate apparatus to be used in producing heat and power by electricity for the purpose of separating ores.

Richfield Springs and Cherry Valley Railroad Company; A. D. Vinton, R. S. Remson, James W. Perry, C. R. Sullivan, Edward J. Knauer, W. G. Peckham, F. Lawton, Jr., T. C. Lewis, J. Drake, Chas. King, John Hagan and Edgar Smith, directors; Capital, $1,000,000. To construct, maintain and operate a railroad between Richfield Springs and Cherry Valley, Otsego County, N. Y.

Incandescent Gas Stove Company, New York; Onazio Lugo, Julius Hoffman and T. O'Conor Sloane, corporators; Capital, $100,000. To manufacture and sell stoves for heating and culinary purposes, in which burning and illuminating gas shall be used as fuel.

The New York Improved Tool Manufacturing Company, Limited, New York; Jacob Cohn, R. D. Alliger, A. P. M. Roome, Wm. H. Beckwith and Thos. C. Kendrick, corporators; Capital, $12,000. To manufacture and sell tools and machines.

The Mixed Vapor Power Company of the United States, New York; Edwin L. Brady, Wm. C. Jones and Geo. R. Crawford, corporators; Capital, $500,000. To manufacture, use and sell certain useful inventions for motors for machinery.

The Mahopac and Cornwall Iron Company, New York; Richard George, George E. Righter, Elias D. Brown, Jos. C. Kent and J. W. Pullman, corporators; Capital, $52,000. To purchase iron ore and mineral lands, and manufacture iron and other metals.

Stearns' Railway Improvement Company, New York; Amos Rogers, Oscar S. Stearns, J. Sanford Potter, R. N. Hazard and Henry C. Hall, corporators; Capital, $300,000. To manufacture, buy, sell, let, hire and deal in cars, car trucks, car axles, car boxes, and other railway apparatus and appliances.

Utah Powder Company, New York; Chas. W. Scofield, Z. P. Boyer and Richmond L. Jones, corporators; Capital, $100,000. To manufacture and sell explosive powder of all kinds.

The Non-Expensive Motor Company, New York; Geo. W. M. Sturgess, Thos. F. Sturgess and N. D. Putnam, corporators; Capital, $500,000. To manufacture and sell machinery and appliances, under the inventions of Joshua Garrett, known as "The Non-Expensive Motor."

The Torrey Automatic Brake Company, New York; Dolphus Torrey, Samuel C. Sloane and Wm. R. Guernsey, corporators; Capital, $500,000. To manufacture and sell improvements in railway brakes.

The S. Allers Company, New York; Solomon T. Streeter, Romeyer Mulligan, Jr., and Willey M. Whitaker, corporators; Capital, $25,000. To manufacture and sell jewelry and gold-plated ware.

The Iron Mountain Company, New York, Chicago and Mexico; Wm. E. Atwater, New York; Jas. K. Hay, Franklin, N.J., and John O. Baker, Newark, N. J., corporators; Capital, $10,000,000. To mine iron and other ores, and manufacture iron.

MASSACHUSETTS.

Hampden Telephone Company, Springfield; Chas. F. Cutler, President; W. M. Ranney, Treasurer; Capital, $120,000. For the establishing and operating of lines and exchanges in Hampden County, Mass., and places adjoining, for the transmission of intelligence by electricity.

Worcester Individual Call and Signal Company, Worcester; Clinton M. Dyer, President; John B. Goodell, Treasurer; Capital, $100,000. For the manufacture, sale and leasing of individual call bells for telephone and telegraph lines, and for other electrical signal call purposes.

Barrett's Junction Water Power Company, Palmer, Wm. B. Kimball, President and Treasurer; Capital, $50,000. To construct dams and canals, and furnish water power for manufacturing purposes with buildings on Swift River, in Palmer and Belchertown, Mass.

NEW JERSEY.

Acme Grist Mill Company, Camden & Philadelphia, Pa.; Thomas B. Sides, Z. T. Subers, William A. Stephens, corporators; Capital, $500,000. To manufacture and sell Grist Mills under letters patent issued to Philip Steinmetz.

United States Gas Regulator Company, Camden and Philadelphia, Pa.; Thomas J. Byles, E. Young Butler, W. H. Lawrence, corporators; Capital, $200,000. To manufacture, sale and use, of Gas Regulators and all the fixtures and commodities connected with the same.

Marine Rapid Transit Company, Camden, N. J., and Philadelphia, Pa.; Zachariah Oram, M.D.; Thos. W. Neill, Robert P. Deckert, and others, corporators; Capital, $5,000,000. To manufacture and sell machinery under letters patent granted by the United States and foreign Governments to Z. Oram, M.D., for improvement in marine propulsion, and the building of vessels and transportation of goods, merchandise, passengers, etc., and to license others to use the same.

Pennsylvania Fabric Finishing Company, Camden; Robert Newton Price, James M. West and Elias M. Greene, corporators; Capital, $500,000. To manufacture and sell chemical solutions under letters patent granted to Daniel M. Lamb and others, and to license others to manufacture and sell.

Block Pavement Company, Camden; Jacob Daubman, William Calhoun and William B. Mann, and others, corporators; Capital, $250,000. To manufacture from stone and other materials blocks for pavements, paving, curbing, and the construction of buildings and other structures.

PENNSYLVANIA.

Seaboard, Pittsburgh and Great Western Railway Company, Philadelphia; Thos. E. Shoemaker, Edwin L. McConaughy, Robert M. Janney, of Philadelphia, and others, corporators; Capital, $2,100,000. To construct a railroad from a point on the Baltimore and Cumberland Valley Railroad in Franklin Co., to a point on the Ohio River in Allegheny County.

Pneumatic Railroad Company, Philadelphia; Wm. H. Cary, 1725 Spring Garden Street; Chas. F. Thacher, 2,124 Cannac Street; Chas. D. Birney, 1,321 Race Street, and others, corporators; Capital, $200,000. To construct a railroad beneath the surface from a point on Columbia Avenue and Broad Street, to a point on Broad Street, a distance of 4 and 90-100 miles.

The Mahoning Coal and Coke Company, Brookville, Jefferson County, Penn.; Wm. H. Pauling, Theo. E. Smith and Benj. F. Neiswender, corporators; Capital, $2,500,000. To purchase, manufacture and sell lumber and iron.

ILLINOIS.

South Chicago and Southern Railroad Company; principal office, Chicago; Charles H. Wood, John J. Bennett, Doughlass S. Taylor, Alex. R. Beck and Wm. S. Hineline, corporators; Capital. $100,000. To construct and operate a line of railroad from South Chicago, on the west side of the Calumet River, thence across said river in a southerly direction to a point on the State line between the States of Indiana and Illinois, in the town of Thornton, Cook County, Illinois.

The Wilmington Coal Field Railroad Company; principal office, Kankakee City; James Mix, John H. Perry, Walter W. Todd, Stephen R. Moore and Daniel H. Paddock, corporators; Capital, $100,000. To construct and operate a line of railroad from Buckingham, in Kankakee County, Illinois, through Braidwood, in Will County; thence running in a northwestern direction to a point on the Chicago, Pekin and Southwestern Railroad.

Joliet and Indiana Railway Company; principal office, Chicago; Alonzo W. Paige, Wm. N. Campbell, Charles E. Sargent, Jno. F. Wilson and Clarence T. Barton, corporators; Capital, $50,000. To construct and operate a line of railroad from the city of Joliet, in Will County, Illinois, running easterly, through the counties of Will and Cook, to a point on the State line between Illinois and Indiana, near Dyer, in Lake County.

Burlington and Ohio River Railway Company; principal office, Carlinville; William C. Shirley, Lewis P. Peebles, Wm. F. Burgdorff, Jacob L. Plain and Geo. W Olbert, corporators; Capital, $3,000,000. To construct and operate a line of railroad from a point on the Mississippi River, in Henderson County, Illinois, opposite the city of Burlington, Iowa, and running in a southeasterly direction across the State to Golconda, in the county of Pope, Illinois.

Hutchinson Furnace and Smoke Consuming Company, Chicago; Asahel Bennett, Moses J. Richards and Geo. W. Acklin, corporators; Capital, $1,000,000. To manufacture and sell Hutchinson's new and useful improvement in steam boilers and other heating furnaces; also improvement in air-feeding attachments for locomotives; also devices for aiding combustion in steam boilers and other furnaces, etc.

The Ruhe Brothers and Meyer Manufacturing Company of Chicago; Chas. Ruhe, Joseph Ruhe and Louis B. Meyer, corporators; Capital, $50,000. The manufacture, purchase and sale of cigars and tobacco.

Machinists' and Engineers' Supplies.

NEW YORK, Oct 20, 1881.

The activity of the supply market continues unabated, and some classes of goods are becoming very scarce. The steady demand since the beginning of the year has given the manufacturers little opportunity of replenishing their reduced stock of specialties. Values are about the same, but tend upward.

Twist drills are getting quite scarce.

Prices on some classes of lathes have advanced about $5 on each lathe.

Wrought iron pipe continues very scarce.

Iron and Metal Review.

There is nothing new of special importance in the Pig Iron market. Business is good, and inquiry active. The tone of the market is strong, which we quote as follows: Foundry No. 1, $25 to $26; Foundry No. 2 X, $23; Gray Forge, $21 to $21.50. The demand for Foreign Iron continues good, with prices as follows: Gartscherrie, $25 to $25.50; Coltness, $26.50; Langloan, $26; Glengarnock, $25; Carnbroe, $24.75; Eglinton, $23.50 to $24.

There are no changes in the demand or prices of Steel and Iron Rails. The market for old rails is stronger at present than last reported. We quote old T rails at $28, and Double Heads at $30. The demand for Wrought Iron Scrap is active; No. 1 is quoted at $31 from yard. The demand for manufactured iron is active, and sales large. Copper continues firm at 18¼c. to 18⅜c for Lake Superior, and 18¾c for Baltimore. Straits Tin, 21½c. to 21⅝cc.; Australian, 21½c; and Billiton, 21⅜c. Lead, 5c. to 5⅛c., according to quality. Spelter Western, 5½c.; Silesian, 5⅝c.; Spelter, 13c. to 14½c.

WANTED

A draughtsman, ten years with H. R. Worthington, of New York, desires a position. Address, P. O. Box 85, Media, Douglas Co., Kansas.

Wanted.—A reliable man to take charge of machinist department in a hardware manufactory. Must be generally competent to manage men, build machinery, make patterns, tools, adjustments, etc. Address, giving experience and place of residence to Foreman, BOX 4, AMERICAN MACHINIST, N. Y.

Wanted.—Two Lathe hands, first-class to work on engines and general machine work. Good wages and steady employment. Address, McEwen Brothers, Wellsville, N. Y.

Wanted a situation as foreman in an iron foundry, by a competent and reliable man. A1 references. Address "Foreman," 35 Arctic Street, Bridgeport, Conn.

A thoroughly competent and experienced steam engineer wants a situation of responsibility, with compensation corresponding to the degree of service rendered. Can furnish every required evidence of ability and reliability. Address, "Chief Engineer," office AMERICAN MACHINIST.

A Marine Chief Engineer, of an extensive experience, wishes a situation to run an engine, or take charge of the steam heating apparatus of a building Is capable of handling all kinds of steam apparatus and do his own repairs Best of references. Address R. L., Box 12, Office AMERICAN MACHINIST, 96 Fulton Street, New York.

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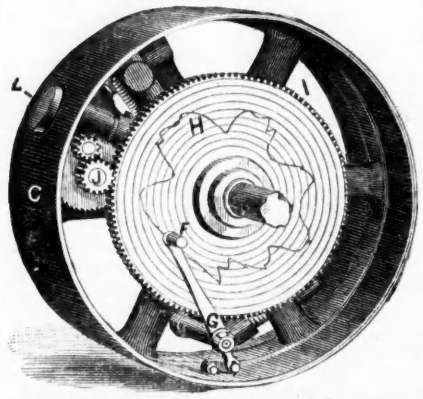
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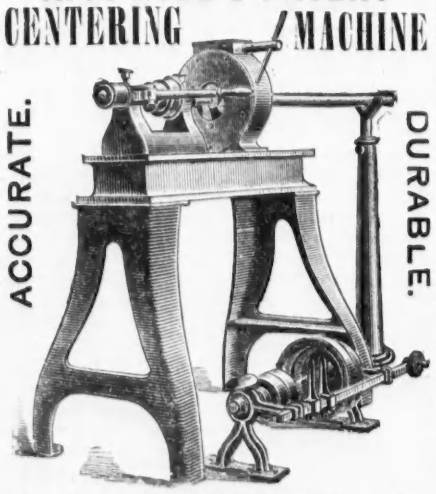
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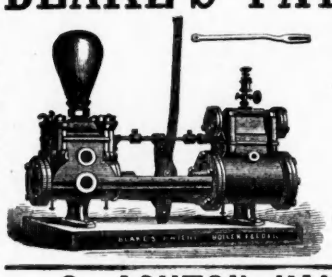
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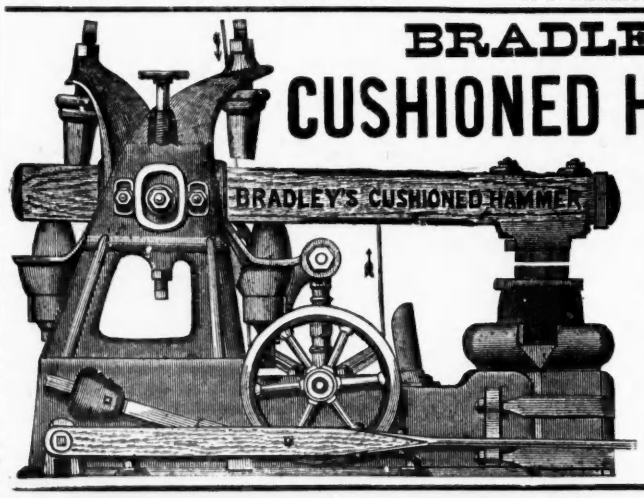

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